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Polypharmacy in adults over 50 in Ireland: Opportunities for cost saving and improved healthcare

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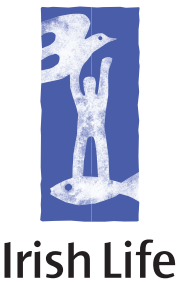
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Polypharmacy in adults over 50 in Ireland: Opportunities for cost saving and improved healthcare

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Executive Summary

- Among community-dwelling people aged over 50 in Ireland, 69% report taking medications regularly. The median number of medications taken regularly in the over 50s is 2, in the over 65s is 3 and in the over 75s is 4.
- One in five of those over 50 years regularly take five or more medications (i.e. polypharmacy).
- Polypharmacy potentially puts the ageing population at greater risk of inappropriate prescribing, non-adherence and adverse drug reactions.
- Those reporting polypharmacy are more likely to be older, have attained a lower educational level, have greater morbidity, worse self-rated health and to have medical card eligibility.
- Although one in three people aged over 65 report polypharmacy, they are responsible for more than half of hospital outpatient and inpatient visits in this age group.
- Polypharmacy accounts for over half of the annual costs of prescribing to the entire population aged over 50 years.
- Medications used to treat cardiovascular conditions (mainly high blood pressure and heart disease) are the most common medications contributing to polypharmacy.
- Almost one half of women and a third of men reporting polypharmacy are taking food supplements regularly.
- The most common food supplements regularly taken are calcium carbonate (with or without vitamin D), Omega-3-triglycerides and Glucosamine.
- Currently one in five medicines used by those reporting polypharmacy is a generic, 15% being a branded generic and 6% a pure generic. Increasing the use of generic medicines could potentially save up to €29.5 million per year.
- In the older population reporting polypharmacy, using a system of reference pricing based on groups of similar drugs could potentially save up to €152.4 million per year.

- For some of the most commonly used drugs the potential annual savings from increasing the use of generics and reference pricing are respectively:
  - Proton pump inhibitors: €10.0 million and €17.8 million per year.
  - ACE inhibitors: €2.9 million and €4.0 million per year.
  - Statins: €0.9 million and €39.9 million per year.
  - Bronchodilator combinations: up to €8.4 million per year.

- Irish prices for many of the generic medications are more expensive than English counterparts - the 10 most commonly prescribed medicines are on average 2.7 times more expensive, with 2 medicines being 6 times more expensive.

Recommendations

- Regular medication review for those taking five or more medications.

- Substitution for a cheaper medicine with the same therapeutic outcome where possible.

- Widespread implementation of an easily accessible system for all prescribers to enable comparison of pricing for all patients

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Contents

1 Introduction

What is TILDA?

TILDA is a longitudinal study of ageing representative of the community-dwelling over 50 year olds in Ireland. In its first wave TILDA recruited a stratified clustered sample of 8,175 individuals with each participant undergoing an extensive in home face-to-face interview, completing a self-reported questionnaire as well as being invited for a health assessment. The overall response rate was 62%. A description of the sample and preliminary findings are available elsewhere (Barrett et al., 2011).

What is polypharmacy?

The proportion of the population aged over 65 years in Ireland is expected to double over the next 35 years from 11% in 2006 to 22% in 2041. Those over 65 years also consume the greatest proportion of medications in Western populations (Families USA, 2000), and in Ireland account for around half of the prescription medications dispensed within the Health Service Executive's Primary Care Reimbursement Service (HSE PCRS).

Increasing life expectancy and associated greater multimorbidity, as well as new drug treatments and indications, all contribute to the development of multiple medication use as people age. However, as older people and those with multimorbidity are often excluded from drug trials there is a lack of high-quality evidence to guide prescribing in the elderly (Hilmer and Gnjidic, 2008).

The definition of polypharmacy varies in the literature, making international comparisons difficult, but it is most commonly defined as the concurrent use of five or more medications and excessive polypharmacy defined as 10 or more medications (Fulton and Riley Allen, 2005). TILDA is also uniquely placed to study concomitant prescription, over-the-counter (OTC) medication, and food supplement use in the over 50s in Ireland, contributing to an under-studied source of potential drug interactions (Ernst, 2000).

What are the consequences of polypharmacy?

Polypharmacy may be necessary to properly manage certain diseases (Aronson, 2006). However, it can also indicate over- and inappropriate prescribing (Steinman et al., 2006), exposing patients to risks of drug interactions and adverse drug reactions (ADRs) (Hanlon et al., 2006). Polypharmacy has also been highlighted as a major determinant of poor medication adherence in the elderly (Vik et al., 2004), although studies have found specific medications like tamoxifen are better adhered to by those with polypharmacy (Barron et al., 2007). In addition, the differing pharmacokinetics and pharmacodynamics in the elderly population already make them more vulnerable to the effects of inappropriate prescribing and ADRs (Fulton and Riley Allen, 2005). Observational studies have also found polypharmacy to be associated with functional impairment (Agostini et al., 2004), falls and fractures (Boyle et al., 2010), hospital admissions (Leendertse et al., 2008), and mortality (Richardson et al., 2011).

Report summary

This report is organised as follows. Chapter 2 outlines the methods and the TILDA variables used within the report. Chapter 3 describes the prevalence of polypharmacy in the community-dwelling Irish aged over 50. It also compares the prevalence of polypharmacy across demographic and health factors. Chapter 4 describes food supplement use and chapter 5 highlights the cost implications of polypharmacy in the ageing Irish population. Finally chapter 6 summarises the report and highlights further research and policy implications and recommendations.

2 Methods

Prevalence estimates within the report are weighted to account for differential non-response in the sample with respect to age, sex and educational achievement and so results are applicable to the Irish population aged 50 years and over.

Health variables used from TILDA

TILDA respondents completed the following health questions used in this report:

- Self-rated health was based on the question "In general, compared to other people your age, would you say your health is: ……". The five response categories were: excellent, very good, good, fair, and poor.
- Chronic pain was defined as a response 'yes' to the question "Are you often troubled with pain?" and graded into mild, moderate, or severe according to the answer to the question "How bad is the pain most of the time? Is it..."
- Urinary incontinence was defined as a response 'yes' to the question "During the last 12 months, have you lost any amount of urine beyond your control?".
- The presence of chronic diseases was established by asking participants if they had ever been told by a doctor that they had the health condition from a list on a card. The number of chronic conditions reported were counted from the following list: (Heart attack or Heart failure or Angina), Cataracts, Hypertension, High Cholesterol, Stroke, Diabetes, Lung Disease, Asthma, Arthritis, Osteoporosis, Cancer, Parkinson's Disease, Peptic Ulcer, and Hip Fracture. The count of chronic conditions was categorized into four groups: none, 1, 2, and 3 or more.
- Presence of disability was assessed by asking participants if they had any ongoing difficulties carrying out normal daily activities. For example, Activities of daily living (ADL) included dressing, eating and bathing and incremental activities of daily living (IADL) included housework, shopping and cooking.

Medication use

Medication use was assessed within the home by a trained interviewer who asked participants 'to record all medications that you take on a regular basis, like every day or every week. This will include prescription and non-prescription medications, over-the-counter medicines, vitamins, and herbal and alternative medicines.' Interviewers also asked to see medication packages to transcribe the correct medication names.

Up to 20 medications were recorded with its brand or generic name per participant. Medications were assigned WHO Anatomic Therapeutic Chemical (ATC) classification codes (WHO, 2011). The WHO ATC codes are classified according to anatomical, therapeutic, pharmacological and chemical subgroups at five levels (see Appendix for more details).

Polypharmacy was defined as the regular use of five or more medicines (excluding food supplements and alternative medications).

Limitations – although medication use was self-reported, this has been shown to be one of the most reliable ways of ascertaining medications (including over-the-counter) taken in the older population (Noize et al., 2009). Reporting was also improved by the interviewers checking participants' medication packages.

Food Supplements

Food supplements were defined according to the European Directive 2002/46/EC (Directive 2002/46/EC, 2012): "Food supplements means foodstuffs, the purpose of which is to supplement the normal diet and which are concentrated sources of nutrients or other substances with a nutritional or physiological effect, alone or in combination, marketed in dose form, namely forms such as capsules, pastilles, tablets, pills and other similar forms, sachets of powder, ampoules of liquids, drop dispensing bottles, and other similar forms of liquids and powders designed to be taken in measured small unit quantities". WHO ATC codes (WHO 2011) were assigned where possible.

In TILDA data on regular use of food supplements was recorded regardless of whether they were obtained on prescription or purchased in a pharmacy or health food shop. So, all products containing active ingredients found in food supplements were considered as food supplements prescribed or otherwise. For example, although Calcichew is licensed as a medicine in Ireland, all calcium products were considered a food supplement in this report.

Medication costs

The prices for the medications recorded in the TILDA dataset were obtained from the HSE PCRS. For each brand name and ATC combination a weighted average price (reimbursement price not including dispensing fees) and strength was calculated using prescription volumes from the eastern region of the PCRS database for 2010. The cheapest alternative was the cheapest weighted average price for each exact pharmaceutical, the 5th level ATC. The reference price used was the cheapest weighted average price for each group of drugs, 4th level ATC.

For comparison of costs with England the total quantities sold and the ingredient cost for each generic were calculated for 2010 from the Prescription Cost Analysis Data produced by the Health and Social Care Information Centre (Health and Social Care Information Centre, 2011). The total ingredient cost of a weighted average supply was calculated for each drug. Costs in GB pounds were converted to Euros using the average annual market spot exchange rates obtained from the Irish Central Bank for 2010 (Central Bank of Ireland, 2012).

TILDA sample

A total of 8,093 (99%) participants provided information about their medication use. The results of this report are based on these 8,093 participants. The participants had an average (SD) age of 64 (10) years, 54% were women, 67% were married, and 49% reported having a medical card. They reported a total of 20,227 medicines and 2,094 food supplements.

3 Polypharmacy

In the Irish population aged 50 years and older, 69% reported regularly taking medications. This proportion increased with age, with 85% in the over 65 year olds and 90% in those over 75 years taking medications regularly. The average (SD) and median (inter quartile range) number of medicines reported in the over 50s was 2.4 (3.0) and 2 (0-4), in the over 65s was 3.4 (3.1) and 3 (1-5) and in the over 75s was 3.9 (3.2) and 4 (2-6), respectively. In the over 50s, 19% were taking five or more regular medicines (polypharmacy) and 2% reported taking ten or more.

Demographics

Table 3.1 presents the prevalence of polypharmacy in the ageing population by age, sex, labour market status, education, and marital status. Older age and lower education are known to be associated with increased polypharmacy (Hajjar et al., 2007) due to the greater disease burden in these groups. The prevalence of polypharmacy increases in the older age groups, rising to 31% in the over 65s and 37% in the over 75s. There was no statistical difference in the prevalence of polypharmacy by sex. Less education, being retired and widowed were associated with a greater prevalence of polypharmacy. Less education and taking early retirement also remained associated with a greater prevalence of polypharmacy, after adjusting for age.

Table 3.1. Prevalence of polypharmacy by age and demographics

	AGE			
Characteristics	**50-64 years**	**65-74 years**	**75+ years**	**Total participants**
Sex				
Men	9%	26%	38%	3,744
Women	11%	26%	36%	4,431
Labour Market Status				
Employed	5%	16%	18%	2,934
Retired (early)	14%	29%	42%	1,511
Retired (at usual age)	19%	23%	38%	1,535
Other	17%	31%	36%	2,195

Continued on next page

	AGE			
Characteristics	50-64 years	65-74 years	75+ years	N
Education				
Primary/none	16%	30%	38%	2,504
Secondary	8%	24%	36%	3,263
Third/higher	8%	19%	34%	2,404
Marital status				
Married	9%	26%	37%	5,450
Never married	12%	23%	32%	979
Separated/divorced	14%	30%	29%	551
Widowed	14%	27%	39%	1,195

Reported health

Table 3.2 presents the prevalence of polypharmacy in the older population by age and health status (chronic disease, disability, pain, urinary incontinence, falls, and self-rated health) and access to healthcare (insurance coverage). Polypharmacy understandably increases with more chronic conditions reported, with more severe disability, and more severe self-reported pain. Polypharmacy was also more common in those reporting urinary incontinence, a fall in the last year and is associated with worse self-rated health. There was a greater prevalence of polypharmacy in those with a medical or GP visit card, but this is likely due to the increased disease burden in these groups.

Table 3.2. Prevalence of polypharmacy by age and health status.

	AGE			
Health Variable	**50-64 years**	**65-74 years**	**75+ years**	**Total participants**
Number of chronic diseases				
0	1%	4%	10%	1,839
1	3%	12%	18%	2,288
2	12%	19%	28%	1894
3 or more	36%	50%	56%	2,154
Disability				
None	8%	22%	31%	7,189
IADL Disability	30%	43%	44%	287
ADL Disability	39%	55%	56%	699
Chronic Pain				
None	6%	19%	29%	5,275
Mild	9%	26%	42%	830
Moderate	16%	37%	47%	1,349
Severe	32%	51%	62%	712
Urinary incontinence				
No	9%	23%	35%	7,127
Yes	13%	37%	43%	1,024
Fall in the last year				
No	9%	23%	35%	6,590
Yes	13%	37%	43%	1,583
Self-rated health				
Excellent	2%	10%	19%	1,715
Very Good	3%	18%	32%	2,745
Good	10%	27%	41%	2,441
Fair	28%	51%	55%	992
Poor	58%	75%	64%	268
Insurance status				
None	7%	16%	n/a*	844
Private	5%	17%	n/a*	3,286
Medical card/GP card	20%	30%	38%	4,041

** Insufficient number in these groups*

Table 3.3 shows the prevalence of the most common health conditions reported by those with polypharmacy. Hypertension, high cholesterol, arthritis and moderate/severe chronic pain were commonly reported by those with polypharmacy. These were also the most frequently reported conditions in the total Irish population aged over 50 years. However, diabetes, angina, and abnormal heart rhythm were more than twice as prevalent in those with polypharmacy compared to the general population.

Table 3.3. Prevalence of the 10 most commonly reported health conditions by those with polypharmacy

Self-reported health condition	Participants reporting polypharmacy (n=1,461)	All participants (n=8,093)
Hypertension	67%	38%
High cholesterol	55%	38%
Arthritis	46%	28%
Moderate/severe chronic pain	46%	26%
Diabetes	26%	8%
Urinary incontinence	21%	12%
Angina	21%	6%
Abnormal heart rhythm	18%	7%
Asthma	17%	9%
Osteoporosis	15%	9%

Healthcare utilisation

Table 3.4 presents the total reported annual GP, hospital outpatient and hospital inpatient visits (in thousands) by age and polypharmacy status. In the population aged 65 years and over, those reporting polypharmacy constitute 31% of the population, but are responsible for 51% of inpatient hospital visits, 55% of outpatient hospital visits and 41% of GP visits. In the population aged 50-64, those reporting polypharmacy constitute 10% of the population, but are responsible for 28% of inpatient hospital visits, 30% of outpatient hospital visits and 25% of GP visits.

Table 3.4. Annual healthcare utilisation by age and polypharmacy status*

	Age 50-64 years		Age 65+ years	
Healthcare utilisation	**Polypharmacy**	**No Polypharmacy**	**Polypharmacy**	**No Polypharmacy**
GP visits	593	1,810	1,017	1,446
Hospital outpatient visits	281	644	459	382
Hospital inpatient visits	34	86	68	65

** Total number of visits reported in thousands.*

Medication classes

Table 3.5 shows the prevalence of the most common medications reported by those with polypharmacy. Anti-thrombotic drugs and lipid modifying agents were the most commonly reported medication classes, each with a prevalence of 69% in those with polypharmacy and 25% and 33% in the total population aged over 50, respectively. In general, the most commonly reported medications in polypharmacy were for the treatment of cardiovascular disease. Drugs for acid related disorders were also very prevalent (47% in those reporting polypharmacy), as well as analgesics (21%) and psycholeptics (20%).

Table 3.5. Prevalence of medication use in the 10 most common medication classes reported by those with polypharmacy

Medication group (ATC*)	**Participants reporting polypharmacy**	**All participants**
Anti-thrombotic drugs (B01)	69%	25%
Lipid modifying agents (C10)	69%	33%
Agents acting on the renin-angiotensin system (C09)	62%	26%
Drugs for acid related disorders (A02)	47%	16%
Beta blocking agents (C07)	42%	15%
Diuretics (C03)	29%	9%
Calcium channel blockers (C08)	28%	10%
Anti-diabetic drugs (A10)	23%	6%
Analgesics (N02)	21%	7%
Psycholeptics (N05)	20%	7%

**ATC = Anatomical Therapeutic Chemical classification system.*

International comparisons

International comparisons of the prevalence of polypharmacy are difficult due to the different definitions of polypharmacy used, sources of medication data, and subgroups of the population studied. Also, polypharmacy prevalence can vary by the year of medication data collection, as it has been reported to be increasing in many western countries (Linjakumpu et al., 2002). However, in general the estimates of polypharmacy prevalence in the ageing Irish population seem comparable to international estimates. In the over 65s in Ireland, polypharmacy was reported by 34%. This is comparable to the prevalence of polypharmacy of prescription medications of 31% in men and 35% in women in 2005-6 in a US study of ageing (Qato et al., 2008), of 25% of the community-dwelling residents of Lieto, Finland in 1998-9 (Linjakumpu et al., 2002) and of 39% in residents of the Emilia-Romana region of Italy in 2007 (Slabaugh et al., 2010). In those aged over 75 in Ireland, polypharmacy was reported by 38%. This is comparable to the 42% taking five or more medications in a Swedish study of over 75s in 2002 (Haider et al., 2008).

4 Food Supplement Use

Food (sometimes referred to as dietary) supplements have been recognised as an important part of providing human wellbeing and health, particularly in populations with recognised low nutritional intakes. However, as they contain active ingredients they can, if taken concurrently with medicines, increase the risk of interactions depending upon the products used and the underlying health condition.

The use of food supplements, including vitamins, minerals, amino acids, and herbals (or other natural products), has increased steadily over the last two decades mainly because of greater knowledge about their benefits and the fact that products are available in pharmacies and health shops without prescription.

Table 4.1 displays the prevalence of food supplement use by polypharmacy status as well as by age group and sex. The overall prevalence of food supplement use was 17% and is higher for women and those reporting polypharmacy e.g. for women reporting polypharmacy the prevalence is 44%. Food supplement use generally did not increase with age within the polypharmacy groups.

Table 4.1: Prevalence of food supplement use by polypharmacy status, sex and age

		Age, years				
Polypharmacy	**Sex**	**50-64**	**65-74**	**75+**	**Total**	**Total for population**
Yes	Men	28%	25%	30%	27%	37%
	Women	46%	42%	45%	44%	
No	Men	4%	6%	10%	5%	11%
	Women	16%	18%	16%	17%	
Total	Men	7%	11%	18%	10%	17%
	Women	20%	25%	28%	23%	

Among the 2,094 food supplements reported, there were 40 different preparations with an ATC code and a further 94 that could not be assigned an ATC code. The five most frequently reported are listed in Table 4.2 and account for 79% of the total supplements with calcium +/- vitamin D comprising around one third and the non-vitamin or non-mineral food supplements omega-3-triglycerides and glucosamine a further third. Less frequent food supplements reported were iron (5%), evening primrose oil (3%), vitamin C (3%), vitamin D and analogues (1%) and garlic (1%).

Table 4.2. The five most frequently reported food supplements

Food Supplement	ATC[a]	%
1 Calcium carbonate with or w/o D vitamin	A12	31
2 Omega-3-triglycerides	C10AX06	18
3 Glucosamine	M01AX05	13
4 Vitamin B single or combinations	A11D, A11E, B03B	9
5 Multivitamins with minerals	A11A, A11B	8

[a]*ATC = Anatomical Therapeutic Chemical classification system.*

International comparisons

In comparable national studies performed in USA, Canada and Europe, food supplement use varied greatly, partly due to different methodologies and populations studied making direct comparison difficult. In community dwelling 57-85 year old USA citizens, 55% of women and 43% of men reported regular (i.e. daily) use of food supplements (Qato et al., 2008). In Canada, 60% of women and 40% of men aged 51-70 years reported regular use of food supplements, and 60% of women and 45% of men aged 71 and older (Vatanparast et al., 2010). In 10 European countries respondents aged 35-74 years were asked what food supplements they had used on a previous day. Women were found to be more frequent users of food supplements then men (Skeie et al., 2009). The lowest use was reported in southern countries like Greece, Spain and Italy with 7-13% for women and 1-8% for men, while Nordic countries (Denmark, Sweden and Norway) recorded a substantially higher prevalence of between 41-64% in women and 28-49% in men. In the UK the prevalence was 47% and 35% for women and men respectively. Comparing the TILDA results to the results in cited studies suggests that the use of food supplements in Ireland is modest compared to other European countries.

5 Potential cost savings from generic substitution and reference pricing

The market for medicines in Ireland is unlike that for other consumer goods as the patient, who is the consumer, does not decide which medicine to use and may not directly pay for the medicine either. The person who does decide, the prescriber, often a doctor neither consumes nor pays for the medicine. The prescriber acts in the patient's interest but is also the gatekeeper of resource use. And the state who may pay for the medicine does not consume or choose the medicine. There is a complex interaction between the patient, the prescriber and the state when a medicine is prescribed and dispensed.

In Ireland 52% of the population over 50 years of age have a medical card which entitles them to medicines paid for by the state. Of those reporting polypharmacy 79% have a medical card. Those without a medical card must pay out of pocket for medicines up to a monthly maximum (€120 in 2010). At the time of this data collection, 2010, medical cards were available to those under 70 years of age with low incomes or for whom medical expenses would cause undue hardship. For those over 70 years the income threshold was higher.

Across all age groups approximately 11% of the total healthcare budget is spent directly on medicines in the community, in 2010 this was in excess of €1.5 billion (Primary Care Reimbursement Service, 2011). Expenditure on those over 50 years accounts for two thirds of the medicines' budget. The use of medicines has increased significantly in Ireland in the last two decades. While this volume increase has lead to a corresponding overall cost increase there has also been an increase in the costs of the individual medicines dispensed (Bennett et al., 2009).

Table 5.1 sets out the estimated annual costs for differing levels of polypharmacy. The overall annual cost of medicines for the over 50's population in Ireland is estimated at €600 million. From Table 5.1 it is evident that while the prevalence of polypharmacy in the population over 50 years is only 19%, this group accounts for 54% of the cost of medicines for the entire over 50s population.

What is a generic medicine?

Patents allow the manufacturers of new medicines to be the sole producer of that drug for up to 20 years. Nobody else can manufacture that medicine while it is under patent. The new medicine is often called the proprietary or originator drug. Patents are necessary to enable pharmaceutical companies recoup the large sums of money they have invested in the research and development of the new medicine. Once this protection expires any company can produce the medicine. Generic medicines are the copies of the original medicine which is no longer protected by patent. They contain the same active pharmaceutical as the original patent protected medicine. Generics are usually cheaper than the proprietary medicines.

How much of the regularly used medicines are generic?

Amongst those over 50 years, approximately 20% of all medicines taken regularly are generics. Pure generics account for 6% and branded generics for 13%. Pure generics are sold using only the name of the pharmaceutical whereas branded generics are sold using a marketing name to differentiate the medicine from other medicines with the same pharmaceutical ingredients.

Why are generic medicines important?

The state prescription drugs bill was more than €1.5 billion in 2010, that's 11% of the government's total spending on health (Primary Care Reimbursement Service, 2011, Department of Health, 2011). Increased generic prescribing would help lower that amount while maintaining the same level of clinical treatment. Paying less for the same pharmaceutical is also important for the patients who have to pay for their drugs out of their own pocket under the drugs payment (DP) scheme.

What is reference pricing?

Medicines belong to groups of similar medicines used to treat the same conditions. Reference pricing is setting one price for all the medicines in a group of similar medicines. For example Atorvastatin belongs to a group of medicines called statins. Reference pricing would mean that if a patient is prescribed Atorvastatin the state would only pay the reference price for statins. If Atorvastatin is more expensive than the reference price the patient would pay the difference. In this report we have set the reference price as the cheapest medicine within each group.

Table 5.1. Annual mean cost of medicines

No. of regular medicines[a]	Population over 50 years of age %	Mean annual cost per person ± Std Error	Predicted total annual cost €'000	Proportion of total cost %
All	100	€471 ± €7	€592,825	100
≤4	82	€270 ± €5	€273,406	46
≥5	19	€1,299 ± €22	€319,419	54
≥7	8	€1,562 ± €39	€175,337	30
≥10	2	€1,388 ± €94	€50,583	9

a. Categories are not mutually exclusive.

In the population over 50 years only 20% of the reported medicines are pure or branded generics, this figure increases slightly to 21% for those who regularly use five or more medicines. Proprietary medicines with a generic equivalent are similar for those with and without polypharmacy at around 37%. The use of medicines that do not have a generic equivalent falls slightly – from 43% in the general population to 42% in those reporting polypharmacy.

Table 5.2 shows that the total annual estimated cost of the top 20 most costly medicine groups for those who regularly take five or more medicines is over €298 million. These 20 medicine groups account for 94% of the cost of reported polypharmacy. Given that generic medicines are generally cheaper compared to their proprietary equivalents increasing the use of generic medicines is one approach that could be used to maintain the same level of medical intervention but at a reduced cost. Table 5.2 shows the maximum savings that could be achieved if generic substitution at the individual pharmaceutical level was maximised in the top 20 most costly therapeutic groups for individuals reporting polypharmacy. For those over 50 who regularly take five or more medications, switching to a bioequivalent generic medicine offers the potential to reduce the annual medicine cost of the top 20 most costly medicines by €29.5 million or 10% of the original cost.

Table 5.2. Savings for substitution at the pharmaceutical level (the 20 most costly therapeutic groups for individuals reporting polypharmacy)

Therapeutic group (ATC)	Current annual cost €'000	Cheapest substitute annual cost[a] €'000	Maximum annual savings €'000	Maximum annual savings (% of current cost)
Lipid modifying agents (C10)	€62,465	€61,529	€936	2%
Drugs for obstructive airways diseases (R03)	€43,787	€41,684	€2,103	5%
Drugs for acid related disorders (A02)	€39,675	€29,455	€10,220	26%
Agents acting on the renin-angiotensin system (C09)	€27,079	€23,019	€4,060	15%
Anti-thrombotic drugs (B01)	€20,094	€14,985	€5,109	25%
Anti-diabetic drugs (A10)	€18,207	€18,015	€192	1%
Antiepileptics (N03)	€14,719	€13,400	€1,319	9%
Psychoanaleptics (N06)	€11,006	€10,644	€362	3%
Urologicals (G04)	€10,231	€8,980	€1,251	12%
Analgesics (N02)	€7,487	€6,159	€1,328	18%
Calcium channel blockers(C08)	€7,268	€6,702	€566	8%
Drugs for treatment of bone disease (M05)	€6,710	€6,710	€0	0%
Anti-inflammatory and anti-rheumatic products (M01)	€6,255	€6,087	€168	3%
Beta blocking agents (C07)	€6,077	€5,648	€429	7%
Psycholeptics (N05)	€5,035	€4,872	€163	3%
Cardiac therapy (C01)	€4,019	€3,568	€452	11%
Ophthalmologicals (S01)	€3,623	€3,161	€462	13%
Diuretics (C03)	€2,548	€2,367	€181	7%
Anti-hypertensives (C02)	€1,568	€1,451	€117	7%
Antibacterials for systematic use (J01)	€822	€712	€110	13%
Total[b]:	€298,676	€269,151	€29,527	10%

a. Cheapest alternative drug with the same 5th level ATC i.e. same pharmaceutical.
b. Total cost for the 20 most costly drugs for the population with polypharmacy (≥5).

Given the high cost of generic medicines in Ireland relative to other countries, the savings from generic substitution at the exact pharmaceutical level is limited. A closer examination of specific medicine groups within the top 5 most prevalent therapeutic groups shows that by broadening the generic substitution to include the cheapest drug within each grouping, cost savings could be further increased from the scenario in table 5.2. For example, substituting branded Atorvastatin for the cheapest available generic statin. However, it must be noted that for clinical reasons it may not always be possible to switch to a cheaper medicine within a given group and the savings presented in Table 5.3 and Table 5.4 are the maximum possible savings. Medicines within the same group are similar in composition and treatment outcome but not bioequivalent (they are not exactly the same in composition and therefore cannot be interchanged in certain circumstances).

Table 5.3 Cost of medicines and potential savings from reference pricing for people aged over 50

	Total Population	Population (≤4 medicines)	Polypharmacy Population (≥5 medicines)
Total Annual Cost (€ million)	592.8	273.4	319.4
Total Annual Cost of cheapest alternative in drug group (€ million)	310.1	143.1	167.0
Potential maximum savings (€ million)	282.7	130.3	152.4
(%)	48%	48%	48%

Table 5.4. Annual savings using reference pricing of specific medicines for people aged over 50 reporting polypharmacy

Therapeutic group (ATC)	PPIs[a]	ACE Inhibitors[a]	Statins[a]	Adrenergics & other drugs for obstructive airway diseases[a]
Prevalence in population (%)[b]	6	4	11	2
Prevalence in polypharmacy population	6	5	9	2
Range of weighted price per month[c]	€16-€41	€7-19	€9-€38	€37-€72
Cheapest to most expensive ratio	2.5	2.9	6.0	1.9
Proportion dispensed as generic[d]				
Pure generic (%)	4	1	2	0
Branded generic (%)	20	25	8	3
Proprietary brand with generic equivalent (%)	77	58	28	0
Proprietary brand without generic equivalent (%)	0	16	63	97
Total cost (€ million)	37.8	10.1	56.2	20.6
Total savings from generic substitution (€ million)	10.0	2.9	0.9	0.0
Total cost of cheapest alternative in drug group (€ million)	20.0	6.1	16.3	12.2
Potential maximum savings (€ million)	17.8	4.0	39.9	8.4
(%)	47	40	71	41

a. *Categories are not mutually exclusive; an individual may be taking combinations of all four medicines.*
b. *All percentages rounded to the nearest whole number.*
c. *Weighted average price = price calculated from average monthly GMS usage and price (in 2010) for each medicine.*
d. *A generic medicine is a copy of the original medicine which is no longer protected by patent. Generics contain the same active pharmaceutical as the original patent protected medicine. A pure generic is sold using the pharmaceutical name only. A branded generic uses a marketing name.*

Table 5.4 shows four drug groups for people aged over 50 who regularly take five or more medicines. The four groups are: anti-ulcer drugs proton pump inhibitors (PPIs); hypertension treatments angiotensin-converting enzyme (ACE) inhibitors; cholesterol lowering statins and bronchodilator combinations; adrenergics and other drugs for asthma and obstructive airway diseases. Each of the four groups is widely used by older people, includes generic substitutes and few clinical barriers to substitution for other medicines within each group.

From Table 5.4 we can see that for those who regularly take five or more medicines 6% regularly take a Proton Pump Inhibitor (PPI). These medicines are used to reduce the acid present in the stomach primarily in the treatment of dyspepsia, peptic ulcer disease and gastroesophageal reflux disease (GORD). The Irish Medicines Formulary (IMF) (2010) lists 5 different PPIs (4th level ATC A02BC), with 26 individual brands, and 2 pure generics. The PPIs in use are dominated by proprietary drugs with generic equivalents, making up 77% of the drugs prescribed in this group. Clinical guidelines on the use of PPIs makes no distinction in the efficacy of individual PPIs (NICE, 2010). The maximum annual cost savings of €17.8 million could be achieved by switching individuals in this group to the cheapest generic medicine in the group.

Of those individuals who regularly take five or more medicines 5% are using ACE Inhibitors which are used primarily in the treatment of hypertension and congestive heart failure. The IMF (Irish Medicines Formulary 2010) lists 11 different ACE Inhibitors (4th level ATC C09AA), with 32 individual brands, and 1 pure generic. The use of ACE inhibitors is dominated by proprietary brands with a generic equivalent at 58%. The maximum annual cost savings of €4.0 million could be achieved by switching individuals in this group to the cheapest generic medicine in the group.

Statins are the second most common drug category dispensed to the over 50 year olds and the most expensive by volume. They are used to help lower cholesterol in the prevention and treatment of cardiovascular disease. Of those individuals who regularly take five or more medicines 8% are using a statin. Cardiovascular disease is responsible for significantly impairing quality of life, reducing labour market participation and increasing the use of health service resources (Gaziano, 2007). Ischaemic heart disease alone has been predicted to increase by 29% in men and 48% in women in developed countries between 1990 and 2020 (Yusuf et al., 2001). The IMF (2010) lists 5 different statins (4th level ATC C10AA), with 18 individual brands, and 2 pure generics. Table 5.4 shows the dominance of branded drugs without a generic equivalent (63%) in this market. The most expensive medicines in this group cost on average six times more than the cheapest. The maximum cost savings of €39.9 million could be achieved by switching individuals in this group to cheaper generic medicines. Since the collection of this data atorvastatin has come off patent which will allow the entry of generic products and see the proprietary brand reduce by 30% in price. This development will decrease the overall cost of statins dispensed and the potential savings that could be achieved via generic substitution.

Bronchodilator combinations are used primarily to treat conditions such as asthma, bronchitis and chronic obstructive pulmonary disease. The IMF (2010) lists 4 medicines in this group (4th level ATC R03AK), 5 individual brands, and no pure generics. The medicines in this group are relatively expensive, up to €72 per month for the average monthly supply. The lack of generics means that the ratio of the cheapest to the most expensive medicine in the group is relatively low at 1.9. Despite this a maximum cost savings of €8.4 million could be achieved by switching individuals in this group to cheaper medicines when clinically possible.

When considering the potential cost savings that could be achieved from reference pricing it must be noted that for clinical reasons it may not always be possible for patients to be switched to the cheapest medicine in a group. Usually a system of reference pricing would allow the full price reimbursement of medicines above the reference price when there is a specific clinical need for a patient to be on that particular medicine. Best available evidence would advocate for regular medication review for patients which, where possible, includes substitution for a cheaper medicine with the same therapeutic outcome (Task force on Medicines Partnership, 2002). The scenario presented here is the maximum savings at 2010 prices. There are a number of other factors that would influence the savings achieved from the introduction of a reference pricing system. For example:

- *the medicines to be included within each group and their relative prices*
- *existing patents for medicines*
- *the response of the pharmaceutical market*
- *the response of the prescribing community*
- *the response of the patients/public*
- *the number of clinical exemptions granted for patients whose prescriber has deemed it necessary for them to be on a higher priced medicine*

International comparisons

Similar to other countries the price of new medicines in Ireland is linked to a reference group of nine EU states including Austria, Belgium, Finland, Denmark, France, Germany, the Netherlands, Spain and the UK. In 2010 a new generic medicine was required to cost at least 20% less than the originator with a further reduction of 15% after 22 months. The level of generic prescribing in Ireland is low at 19% relative to countries like the United States at 78% (IMS Health, 2011), the United Kingdom at 60%, the Netherlands at 57% and Spain at 24% (Vogler, 2012). In addition, the high cost of generic medicines in Ireland relative to other countries limits the savings that can be made from generic substitution at the exact pharmaceutical level (5th level ATC) (see table 5.2). A brief comparison with generic medicine prices in England highlights why savings from direct generic substitution in Ireland are so low. Table 5.5 shows the price differences between Ireland and England for the top ten medicines for which a direct (5th level ATC) generic substitute is available. Irish generic prices for seven of these medicines are

more expensive than their English counterparts, with two medicines approximately 6 times more expensive. If all patients on these drugs were switched to a generic at a cheaper English price an additional €25m per annum would be saved. However it must be noted that England has a different health care system to Ireland and different cost base.

Table 5.5 England/Ireland comparison of generic prices for top 10 medicines used by polypharmacy population with a generic available.

	Weighted average Irish price (€)[a]	Weighted average English price (€)[a]	Ratio of Irish to English price	Potential extra savings if English price applied (€'000)[b]
ASPIRIN	0.33	1.26	0.3	-1,458
BISOPROLOL	4.38	4.30	1.0	47
AMLODIPINE	7.97	1.88	4.2	2,899
METFORMIN	2.74	3.94	0.7	-549
RAMIPRIL	6.02	2.12	2.8	1,620
PERINDOPRIL	8.06	3.32	2.4	1,751
CLOPIDOGREL	39.03	14.11	2.8	8,130
GLICLAZIDE	3.52	3.95	0.9	-130
OMEPRAZOLE	25.01	4.08	6.0	6,103
LANSOPRAZOLE	18.65	3.15	5.9	4,504

a. *Weighted average price = price calculated from average monthly GMS usage and price (in 2010) for each medicine.*
b. *Additional savings gained from switching from Irish to English generic prices.*

6 Conclusions

There is considerable polypharmacy in the over 50s in Ireland. The prevalence independently increases with age, more reported health conditions, and more severe chronic pain. This potentially puts the ageing population at greater risk of duplication of therapy, drug interactions, non-adherence and ADRs (Hajjar et al., 2007). Whilst part of the prescribing is for cardiovascular disease prevention, the rate of potentially inappropriate prescribing has been reported as 36% in the Irish population aged over 70 (Cahir et al., 2010) using the Screening Tool for Older Peoples Prescriptions (STOPP) criteria (Gallagher et al., 2008), but this is likely to be an underestimate of the true rate given that not all criteria were applied. The full STOPP criteria cannot be applied to TILDA currently as dose and duration of medication use is not available, however this may be possible in future waves.

The findings of this report highlight the need for interventions to assess the appropriateness of prescribing in the elderly in Ireland. Potential interventions include regular medication reviews and computer-based feedback on appropriate prescribing. Interventions could be targeted at the GP, pharmacist or hospital outpatient level and ideally would involve interactions between these health-care providers. Data on the current frequency of medication reviews was not available in TILDA. There have been many successful randomized controlled studies assessing the effectiveness of physician or pharmacist led inventions aimed at reducing polypharmacy on a marker of medication reduction (e.g. reducing medication burden, correcting underuse, and improving medication appropriateness) (Steinman and Hanlon, 2010). The most successful being those that implement multidisciplinary team interventions. However, the studies have generally been underpowered for clinical outcomes. A reduced rate of serious adverse drug events was observed within inpatient and outpatient geriatric clinics of veterans in the US in a large multidisciplinary intervention (Schmader et al., 2004). Similarly, in a study of a clinic of US veterans a reduction in adverse drug reactions was observed for those receiving medication management by pharmacists providing written drug recommendations to physicians versus usual care, although non-significant (Hanlon et al., 1996). Limited data exist on interventions to improve physicians' ability to correct inappropriate prescribing (Steinman and Hanlon, 2010). In a study of hospitalized elderly patients in Ireland randomized to receive screening with STOPP/START criteria by their attending physicians or usual care, significant improvements in prescribing appropriateness were sustained for 6 months after discharge (Gallagher et al., 2011). The high levels of healthcare utilization by those with polypharmacy suggest the potential to target

this group with primary care interventions aimed at preventing hospital admissions, such as increased medical surveillance.

This report also highlighted the high levels of concomitant food supplement use in those reporting polypharmacy (44% in women, 27% in men). This stresses the importance of GPs and pharmacists discussing food supplement use with patients in order to reduce the potential risks from interactions with medicines and to optimize their potential benefits. More research is needed to quantify the health risks of concomitant polypharmacy and food supplement use.

More than €319 million is spent each year on medicines for the one in five of the population aged over 50 with polypharmacy. Of those with polypharmacy 79% have a medical card and one in five of the medicines prescribed are a pure or branded generic. This compares poorly with other cultures such as the US and UK. Given the high cost of generics relative to other countries, the savings from generic substitution at the exact pharmaceutical level in Ireland is limited to €29.5 million for those over 50 who take five or more medicines regularly. Generic prices in Ireland for the most commonly used medicines are several times more expensive than their English counterparts. For those with polypharmacy, dispensing the cheapest medicine in each drug group, for example the cheapest statin, could save up to €152.4 million per year. It must be noted that for clinical reasons it may not always be possible for patients to be switched to the cheapest medicine in a drug group. Best available evidence would advocate for regular medication review for patients with substitution for a cheaper medicine with the same therapeutic outcome where possible. A further recommendation would be to implement simple access systems for physicians to compare medicine prices when prescribing, which is currently not common practice in Ireland.

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8 Appendix

The complete classification of the drug "metformin" illustrates the structure of the Anatomical Therapeutic Chemical (ATC) code:

A	1st level, anatomical main group	Alimentary tract and metabolism
A10	2nd level, therapeutic subgroup	Drugs used in diabetes
A10B	3rd level, pharmacological subgroup	Blood glucose lowering drugs, excl. insulins
A10BA	4th level, chemical subgroup	Biguanides
A10BA02	5th level, chemical substance	Metformin

Thus, in the ATC system all plain metformin preparations are given the code A10BA02.

Adapted from: WHO Collaborating Centre for Drug Statistics Methodology, Guidelines for ATC classification and DDD assignment 2012. Oslo, 2011.

tilda

Staidéar Fadaimseartha na hÉireann um Dhul in Aois

The Irish Longitudinal Study on Ageing