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Health 2.0: Nudging Towards Health and Wellness

Estimated Latent Cost Savings

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Full report available from Medfit at www.medfit.ie

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In 2014 terms, when discounted at a rate of 3% per year, under the scenario where there is a 2.5% reduction in hip replacements per year, the percentage potential **cumulative cost saving from a Medfit targeted WLP amounts to 2.4% of €1.87bn = €448m** capitalised to 2046.

Calculating the present value of the total cost to the State from obesity and the complications of type-2 diabetes in current (2014) monetary terms (i.e. the capitalised cost to the State to 2046) at €9.98bn, a scenario in which the problems of overweight/obesity in the 55-65 age group are being addressed through the proposed WLP preventive health and wellness intervention (at relatively little additional cost) at Medfit could potentially **reduce this figure to €9.49bn**, **a saving of €490m**, assuming a 1% annual decrease in the age-related obesity rate and a relatively small reduction in overweight/obesity but a larger (proportionate) fall in the complications associated with type-2 diabetes in this age cohort.

Health 2.0 is 21st century health. It is about *nudging* people into participating in a *wellness-and-lifestyle programme* (WLP). It is about rational discriminating patients making decisions about their quality of life, trying to avoid 'amenable mortality' – deaths from 'causes that should not occur in the presence of timely and effective health care'. Medfit are a pioneer in Ireland in the delivery of Heath 2.0. Medfit's targeted interventions to address weight and improve metabolic equivalent of task (MET) scores, and quality of life of the rational patient, are exemplars. The economic benefits of their 'nudging' policy, was computed by Patrick McNutt and Patrick McCloughan.

The clinical trial data from Medfit indicates that WLPs can significantly enhance METs and health status. According to Medfit data, an average of 77.4 hours of targeted exercise over a period of 6 months achieves a 42% change in quality of life regarding back pain (based on a sample of 300). During the period of targeted exercise, Medfit recorded significant improvement in people's MET fitness levels and increases with activity (e.g. cycling at 3mph incurs 2-3 METs, at 10mph 5-6 METs, while running at 6mph typically incurs 10 METs).

In the analysis, figures were compiled – although conservative (by design,) nevertheless they serve to show the significant latent cost savings likely to result from WLP. For example, making use of Health Service Executive (HSE) information, together with population projection data from the CSO (Central Statistics Office), the costs associated with the incidence of hip replacements in Ireland during 2014-2046 was modelled. The HSE data indicate an incidence rate of 3.15 hip replacements per 1,000 of the population in Ireland. With the population projections, it is anticipated that there will be rapid growth in the number of hip replacements over the next two decades, given the ageing population structure of Ireland, adding further to the already high annual cost of this form of orthopaedic procedure.

The average cost per year in Ireland of hip replacements is €16,000 (a figure well in excess of the EU average); the projected cost savings of WLP relative to the *status quo* varies from 2.4% to 9.6% depending on whether WLP reduces the incidence of hip replacements by 2.5% or 10% respectively. In a scenario with no change in the incidence of hip replacements the cumulative non-discounted cost of hip replacement surgery during 2014-2046 is estimated at almost €3bn or €1.87bn in 2014 terms, when discounted at a rate of 3% per year.

The analysis also focused on improving METs and quality of life for patients with obesity and complications of type-2 diabetes. The biggest latent cost savings were likely to arise under a scenario which pertains to a targeted Medfit intervention designed to reduce (in a relatively small way) the incidence of obesity and complications from type-2 diabetes among 55-65 year olds. WLP intervention in Health 2.0 could facilitate a fall in bariatric as well as conventional surgery to deal with the problems of overweight/obesity (bariatric surgery includes the use of gastric bands to address obesity), resulting in significant latent cost reductions for the State and insurance companies, and actualised benefits and quality of life gains for patients.

SUMMARY OF KEY FINDINGS OF THE REPORT

Health 2.0 is about nudging people into participating in a *wellness-and-lifestyle programme* (WLP). It is about rational discriminating patients making decisions about their quality of life, trying to avoid 'amenable mortality' – deaths from 'causes that should not occur in the presence of timely and effective health care'. The results presented in this report provide robust statistical support on the long-term benefits to Irish healthcare of nudging towards WLP, as pioneered by Medfit's targeted interventions to address weight and improve metabolic equivalent of task (MET) scores and quality of life of the rational patient.

The key findings of our study are as follows:

1. Based on independent, estimated average costs of €369 and €16,394 per person per year in respect of obesity and the complications of type-2 diabetes respectively, it is estimated that the non-discounted costs equate to over €15bn during 2014-2046.
2. Targeted intervention towards reducing the incidence of complications from type-2 diabetes among overweight or obese 55-65 year olds is shown to be more cost effective compared with interventions aimed at bringing down the incidence of obesity among both 5-9 and 55-65 age groups.
3. Scenario X is where there is no change in the 2% of the population (minus the 5-9 and 55-65 years cohorts) at risk from the complications of type-2 diabetes; while Scenario Y is where the incidence rate (2% in 2014) is falling by 5% over the rest of the observation period to 2046. The present value of the cost (to the State and private health insurers) of this 2% is over €29bn during 2014-2046 and would be €28bn if there was a 5% reduction in the rate per year.
4. The analysis presented in Table 2 shows that, relative to the *status quo*, the biggest cost savings are likely to arise under Scenario 4, which pertains to a targeted Medfit intervention designed to reduce (in a relatively small way) the incidence of obesity among 55-65 year olds and address complications from type-2 diabetes in this age cohort.

To further analyse and integrate the likely cost savings from Medfit targeted interventions, addressing weight and improve METs and quality of life, we have considered that segment of the population most at-risk from hip problems, namely those aged 45-75 years.

5. Assuming no change in the incidence of hip replacements – the cumulative non-discounted cost of hip replacement surgery during 2014-2046 is estimated at almost €3bn or €1.87bn in 2014 terms or €1.87bn when discounted at a rate of 3% per annum.
6. Medfit trial data showing improvements in MET scores translate into appreciably large cost reductions in the range 9.6% and 2.4% in the cost of hip replacement surgery in Ireland over the period (both expressed in present value/discounted cost terms).
7. The clinical trial data from Medfit indicates that WLPs can significantly enhance METs and health status. Translating the results into our economic analysis, we consider two additional (conservative) scenarios from such intervention – Scenario Z2 where there is a 2.5% reduction in hip replacements per year and Scenario Z3 where the reduction is 10%. Under the Z3 scenario, the percentage cumulative cost saving from the target WLP amounts to 9.6% relative to the *status quo*; and is estimated at 2.4% under the Z2 scenario.

BREAKDOWN OF ANALYSIS

The High Current Cost of Obesity and Particularly Type-2 diabetes in Ireland

The results presented in Table 1 below show the projected incidence of obesity and the complications from type-2 diabetes in Ireland, and their costs, during 2014-2046, based on the CSO population projections and current rates of obesity and complications associated with type-2 diabetes – assuming no change in the rates of occurrence during the period (i.e. the non-discounted costs of Scenario 1).

Table 1: Incidence of, and Costs Associated with, Obesity and Type-2 diabetes in Ireland – *Non-Discounted Costs (€bn, 2014-2046)*

	2014	2016	2021	2026	2031	2036	2041	2046
Population (000s)								
5-9 years	343.5	360.5	373.2	334.7	304.6	304.1	331.5	360.7
55-65 years	485.6	503.1	558.0	611.3	663.6	712.9	700.9	613.7
Sub-Total	829.2	863.6	931.1	946.0	968.1	1,016.9	1,032.4	974.4
Total Population	4,642.0	4,687.3	4,884.2	5,076.9	5,254.2	5,440.0	5,633.6	5,821.7
Persons with Obesity and Type 2 Diabetes (000s)								
Obesity								
5-9 years	68.7	72.1	74.6	66.9	60.9	60.8	66.3	72.1
55-65 years	97.1	100.6	111.6	122.3	132.7	142.6	140.2	122.7
Sub-Total	165.8	172.7	186.2	189.2	193.6	203.4	206.5	194.9
Complications from Type 2 Diabetes								
55-65 years	19.4	20.1	22.3	24.5	26.5	28.5	28.0	24.5
Cost (€bn)								
Obesity	0.06	0.06	0.07	0.07	0.07	0.08	0.08	0.07
Complications from Type 2 Diabetes	0.32	0.33	0.37	0.40	0.44	0.47	0.46	0.40
Total Cost	0.38	0.39	0.43	0.47	0.51	0.54	0.54	0.47
Total Cost Cumulative (Non-Discounted)	0.38	1.16	3.25	5.53	7.99	10.63	13.32	15.81
Total Non-Discounted Cost	15.81							
Present Value of Total Cost	9.98							

Source: Irish Heart Foundation, HSE, CSO, authors' analysis.
Note: 2011 is the base year on which the CSO's population projections are based and projections are with respect to each subsequent year. Discount rate of 3% per year.

Based on estimated average costs of €369 and €16,394 per person per year in respect of obesity and the complications of type-2 diabetes respectively (from other information sources), it is estimated here that the non-discounted costs of both conditions total over €15.81bn across the period 2014-2046, which represents a considerable cost to the State and health insurers.

However, this cumulative total cost (€15.81bn) does not take into account the time value of money and, using a 3% annual discount rate, we calculate that the present value of the total cost to the State from obesity and the complications of type-2 diabetes in current (2014) monetary terms (i.e. the capitalised cost to the State to 2046) is €9.98bn (it is smaller than the non-discounted cumulative total because the discounting process reduces the weight given to future costs further out in time to 2046).

Discounted Outcomes of Scenarios

Table 2 below shows the present value of the cost during 2014-2046, and sub-periods therein, of each of the four scenarios outlined above (as previously, the figures are discounted at a rate of 3% per year, reflecting the current cost of capital).

Table 2: The Significance of a Targeted Intervention Programme aimed at the 55-65 Year Cohort

	Present Value of Total Cost to the State (€bn)					
Time Period for Discounting	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario X	Scenario Y
2014-2021	2.93	3.08	2.80	2.80	9.17	8.77
2014-2026	4.62	4.88	4.41	4.41	14.12	13.48
2014-2031	6.20	6.55	5.91	5.90	18.57	17.70
2014-2036	7.66	8.10	7.30	7.29	22.53	21.47
2014-2041	8.95	9.47	8.52	8.51	26.08	24.84
2014-2046	9.98	10.56	9.50	9.49	29.29	27.89

Source: Irish Heart Foundation, HSE, CSO, authors' analysis.
Note: 2011 is the base year on which the CSO's population projections are based and projections are with respect to each subsequent year. Discount rate of 3% per year.

The cells highlighted in green show the lowest cost in each period. It is apparent from the analysis that the greatest cost savings overall are likely in the fourth scenario, where the WLP wellness programme would focus on the at-risk age cohort with the greatest source of cost, by reducing in a small way the incidence of obesity among people aged in this bracket and in turn the incidence of complications from type-2 diabetes.

In Table 2, we have also calculated the cost in respect of the overall population (bar the two age categories considered here) and the statistic that 2% of the overall population are at risk from the complications of type-2 diabetes. In particular, Scenario X is where there is no change in the 2% of the population (minus the 5-9 and 55-65 years cohorts) at risk from the complications of type-2 diabetes; while Scenario Y is where the incidence rate (2% in 2014) is falling by 5% over the rest of the observation period to 2046. The analysis shows that the present value of the cost to the country of this 2% is over €29bn during 2014-2046 and would be €28bn if there was a 5% reduction in the rate per year.

Medfit's Targeted WLP – Data from Trials Applied to the Problem of Hip Replacement

According to Medfit data, an average of 77.4 hours of targeted exercise over a period of 6 months achieves a 42% change in quality of life regarding back pain (based on a sample of 300). During the period of targeted exercise, Medfit recorded significant improvement in people's MET fitness levels, where MET denotes metabolic-equivalent-of-task and increases with activity (e.g. cycling at 3mph incurs 2-3 METs, at 10mph 5-6 METs, while running at 6mph typically incurs 10 METs). The Medfit results were compared with similar data from Look AHEAD, which focused on type 2-diabetes – the Medfit data pertain to patients undergoing rehabilitation at Medfit and thus people who are ill, injured or have undergone surgery and have low mobility akin to those with type 2-diabetes. The results of the Medfit trials are striking: among the Medfit group undergoing WLP, the change in MET from starting to peak activity was 6.6 to 8.8 or an increase of one-third (33%). This compared with the control group 5.1 to 5.3 (4%) and Look AHEAD (22% increase from 5.1 to 6.2).

We believe that this is an intriguing area of future work - Medfit targeted programmes and health insurance providers targeting *healthier* rational customers selecting more comprehensive coverage than they would otherwise prefer. If rational consumers of health insurance do not have the information to adequately choose a WLP insurance plan, or have high tangible switching costs, there could be a lost opportunity for PHIs as healthy potential consumers are not maximising their individual well-being as insured consumers of health and wellness. Given other data that we have reviewed in respect of the relationship between MET improvement and quality of life/general health, the reductions specified under the Z2 and Z3 scenarios may be conservative and, if WLP were to be applied in a pre-emptive manner in the age cohort (that is, among middle-aged people before they become ill or experience chronic pain), the cost savings over time may be even greater than 10%. The results in turn provide evidence-based support for an incentive mechanism aimed at rewarding such people for participating in a wellness-and-lifestyle programme

Other research data maintained at Medfit shows how improvements in MET scores are associated with appreciable improvements in people's quality of life and survival rates (among middle-aged and elderly people). For example, a one-third increase in a person's MET, like that observed in the Medfit trials, is associated with similar or significant improvements in general health and survival prospects – suggesting that the elasticity of survival or amelioration of the complications from type-2 diabetes with respect to metabolism/MET improvement may be close to or even greater than unity (i.e. an x% improvement in a person's ability to sustain higher metabolic activity from WLP may be associated with an approximately x% reduction in the complications associated with type-2 diabetes and thus more QALYs or quality adjusted life years).

To further illustrate the likely cost savings that could be achieved from Medfit WLP initiatives, we have carried out additional data analysis relating to one of the most costly categories of medical intervention in Ireland, namely hip replacements, which are most prevalent among people aged 60+. According to an independent surgery price comparison website, which compares prices in the UK, Ireland and other parts of Europe (recognising that patients are increasingly 'shopping around' in respect of surgical procedures), the average cost of a hip replacement in Ireland is €16,000, the highest level among the European locations for which price data are available. The *implied health elasticity* figures used in the analysis, although conservative (by design,) nevertheless serve to show the significant cost savings likely to result from WLP.

Analysis of Medfit's WLP Data

The clinical trial data from Medfit indicated that WLPs can significantly enhance METs and health status. Two scenarios from such intervention were considered – Scenario Z2 where there is a 2.5% reduction in hip replacements and Scenario Z3 where the reduction is 10%. The results reveal that Scenario Z3 would lead to a 9.6% fall in the cost of hip replacement surgery in Ireland over the period and Scenario Z2 a 2.4% fall in the cost (both expressed in present value/discounted cost terms) and each compared with the case in which there would be no WLP intervention (Scenario Z1).

To analyse the cost savings from Medfit targeted interventions to address weight and improve METs and quality of life, we have considered that segment of the population most at-risk from hip problems, namely those aged 45-75 years. According to the HSE, at least 4,500 hip replacements are carried out each year in Ireland, implying an estimated cost of at least €72m per annum.

Table 3 below makes use of this HSE information, together with the CSO population projection data, to model the incidence of hip replacements in Ireland during 2014-2046. The HSE data indicate an incidence rate of 3.15 hip replacements per 1,000 of the population in Ireland and, along with the population projections, it is anticipated that there will be rapid growth in the

number of hip replacements over the next two decades, given the ageing population structure of Ireland, adding further to the already high annual cost of this form of orthopaedic procedure. In **Scenario Z1** – no change in the incidence of hip replacements – the cumulative non-discounted cost of hip replacement surgery during 2014-2046 is estimated at almost €3bn or €1.87bn in 2014 terms, when discounted at a rate of 3% per year.

Table 3: Estimated Cost Savings from WLP in Ireland – *the Case of Hip Replacements (2014-2046)*

Population (000s)	**2014**	**2016**	**2021**	**2026**	**2031**	**2036**	**2041**	**2046**
45-75 years	1,429.8	1,492.7	1,652.1	1,801.4	1,895.7	1,907.7	1,872.5	1,871.5
Total Population	4,642.0	4,687.3	4,884.2	5,076.9	5,254.2	5,440.0	5,633.6	5,821.7
45-75 % of Total Population	30.8%	31.8%	33.8%	35.5%	36.1%	35.1%	33.2%	32.1%
Estimated Hip Replacements								
Number	4,500	4,698	5,199	5,669	5,966	6,004	5,893	5,890
Cost of Hip Replacements								
Scenario Z1 - No Change in Incidence of HPs								
Cost (€m)	72.0	75.2	83.2	90.7	95.5	96.1	94.3	94.2
Cumulative Cost (Non-Discounted) (2014-2046) (€bn)	2.95							
Present Value or Discounted Cost (2014-2046) (€bn)	1.87							
Scenario Z2 - 2.5% Reducation in Incidence of HPs pa								
Cost (€m)	72.0	73.3	81.1	88.4	93.1	93.7	91.9	91.9
Cumulative Cost (Non-Discounted) (2014-2046) (€bn)	2.88							
Present Value or Discounted Cost (2014-2046) (€bn)	1.83							
% Cost Saving relative to Scenario Z1	2.4%							
Scenario Z3 - 10% Reducation in Incidence of HPs pa								
Cost (€m)	72.0	67.6	73.4	81.6	85.9	86.5	84.9	84.8
Cumulative Cost (Non-Discounted) (2014-2046) (€bn)	2.66							
Present Value or Discounted Cost (2014-2046) (€bn)	1.69							
% Cost Saving relative to Scenario Z1	9.6%							

Source: Medfit trials; HSE (incidence of hip replacements); www.surgeryprice.co.uk (hip replacement cost); CSO (population projections); and authors' analysis.
Note: Discount rate of 3% per year.

The clinical trial data from Medfit indicates that WLPs can significantly enhance METs and health status. Translating the results into the present context, we consider two additional (conservative) scenarios from such intervention – **Scenario Z2** where there is a 2.5% reduction in hip replacements per year and **Scenario Z3** where the reduction is 10%. The results in Table 3 reveal that Scenario Z3 would lead to a 9.6% fall in the cost of hip replacement surgery in Ireland over the period and Scenario Z2 a 2.4% fall in the cost (both expressed in present value/discounted cost terms). Such benefits are likely to be underestimates for the reasons stated and additionally because, in addition to lowering the incidence of hip problems in the most at-risk group, the Medfit WLP would also lower other medical problems in the cohort with consequent additional cost reductions (in helping to lower cancer, cardiac and metabolic problems as well as orthopaedic problems).