A real burden of diabetes today and tomorrow - cutting costs or investing in a better treatment?

Marcin Czech

ISPOR Polish Chapter, Polish Pharmacoeconomic Society
Institute of Organisation and Management
Department of Pharmacoeconomics, Medical University of Warsaw
Europe East Regional Office, Novo Nordisk

1st Congress of ISPOR Bosnia Chapter
Sarajevo, 14-15.10.2011
Agenda

• Basics of health economic (HE) evaluation
• Burden of diabetes mellitus (DM), global, Central European and Polish perspectives
• Modelling in search for a cost-effective treatment
• Long-term cost-effectiveness or short-term cost of control?
Basics of Health Economics

• Demand for healthcare is infinite
  – Increased expectations and technological change

• Resources are scarce
  – Doctors, nurses, drugs

• Choices are necessary
  – Do we increase hip replacements or renal transplantations?

• Prioritisation is required
  – On what basis?

• Costs and benefits must be compared
  – How do we measure benefits?
The opportunity cost of one year’s treatment for diabetes

- One-third of a cochlear implant
- One-third of a junior school teaching assistant for a year
- 150 vaccinations for Measles, Mumps and Rubella
- One-thousandth of a Challenger 2 military tank
- 1 heart bypass operation
- 11 cataract removals
- 2000 school dinners

Morris S, Devlin N, Parkin D Economic Analysis in Health Care John Willey & Sons Ltd. 2007
Why diabetes?

• UN focus on non-communicable diseases including DM
• EU expressing interest in DM, EU Forum on DM in 2012
• WHO and IDF working on directions of diabetes care in Europe
• National Diabetes Plans in the majority of European countries
Diabetes: the economic impact of a global pandemic

- Estimated global healthcare expenditures to treat and prevent diabetes and its complications are at least 376 billion USD in 2010.

- By 2030, this number is projected to exceed some 490 billion USD.

- An estimated average of 703 USD per person was spent on diabetes in 2010 globally.

Cost of complications

- Antidiabetic drugs - 7%
- Outpatient care - 18%
- Other drugs - 20%
- Hospitalisation - 55%

CODE-2 (Jönsson 2002) - Distribution of overall cost for individuals with type 2 diabetes in Sweden, Belgium, Germany, France, Holland, Spain and Italy
Diabetes health care costs in Europe

Diabetes costs are mainly due to late stage complications and hospitalisation

**

Anti-diabetic drugs only account for 7%

Jönsson, 2002
Cost of medicines in people with diabetes in Europe

- Cardiovascular + lipid-lowering (42%)
- Anti-infectious (2%)
- Gastro-intestinal (6%)
- Insulin (11%)
- Oral anti-diabetics (13%)
- Other drugs (26%)

Country specific data (e.g. Spain)

Jönsson, 2002
Objective: to review all studies concerning costs of diabetes type 1 and type 2 and its complications in Central and Eastern Europe, Western Europe, USA and Canada.

Conclusions

1. 105 studies on cost of DM type 1 and type 2 and its complications were found
2. 14 studies concerned cost of DM in Central and Eastern European countries
3. 91 studies described cost of diabetes in Western Europe
Conclusions

1. Only one study concerning cost of diabetes was found for Serbia, Lithuania and Bulgaria. 7 studies were identified in Poland and 3 studies were carried out in Czech Republic.

2. Results of this review reveal the necessity of carrying out more studies concerning cost of diabetes and its complications in Central and Eastern European countries.
Burden of DM in Poland

- based on the National Insurance Fund and the Social Insurance Institution data
- estimated at 2.5 bil. EUR/year for 38 m country, 2.7 m diabetics
- complications 5 times more costly than treatment
- 50% indirect costs due to disability pensions and absenteeism
- cost increase 12% YtY
- hospitalisations cost increase 100% between 2004 and 2009
- reimbursement increase 26% between 2005 and 2009

Leśniowska J, Schubert A, Skrzekowska-Baran I Cost Of Diabetes And Its Complications In Poland. Preliminary Results ISPOR 2011

HTA of DM compounds in Poland

Methods:

• A search was conducted on the webpage of AOTM (http://www.aotm.gov.pl) for HTA reports on the following products: Rosiglitazon, Pioglitazon, Sitagliptin, Vildagliptin, Saxagliptin, Exenatide, Liraglutide, Glargine, Detemir, Aspart, Glulisene and Lispro.

Results:

• Of a total of 163 reports (published between 2007-2010), 8 reports in Polish language on diabetes were identified and assessed.
  – Two reports can be viewed as secondary assessment of regulatory safety discussions.
  – The other six reports assessed the implementation of new diabetes compounds with assessment of efficacy, safety and cost effectiveness of the drugs.
  – Two reports assessed safety concerns associated with the risk of cancer and concluded based on EMA and FDA research that no increased risk was associated with these agents.
  – Rosiglitazone and Sitagliptin were not recommended for reimbursement due to availability of other treatments with similar efficacy.
  – Saxagliptin, Exenatide and Liraglutide got the recommendation to be reimbursed due to expected increase in QALYs.
  – Glulisene which got the recommendation to temporary reimburse (two years) provided that data on hard endpoints (not specified in public report) and cost effectiveness should be delivered.

• The AOTM’s recommendation is obligatory for the Polish Ministry of Health.

Adalstein JE, Czech M, Skrzekowska- Baran I. Health Technology Assessment of diabetes compounds: The Polish perspective, Value in Health, ISPOR 2010
Where should we look for cost-effective treatment?

- Prevention
- (early) detection
- Better treatment
CORE Diabetes Model

- disease computer simulation model developed to project the long-term health outcomes and economic consequences of interventions in type 1 and type 2 diabetes.
- a non-product specific analysis tool
- real-time simulations based on baseline patients characteristics and diabetes screening and treatment
CORE Diabetes Model

• the model is based on a series of 15 independent Markov sub-models that simulate the progression of disease-related complications.
• each sub-model uses time, state, and diabetes type–dependent probabilities derived from published sources.
• health state utility values for disease and treatment-related outcomes are used to determine quality-adjusted life years (QALYs)
• extensively validated, published, used for decision making, easily adopted for local requirements
The break even time for investment in better quality of care is 6-8 years.

Direct healthcare costs for diabetes
£ Millions

- Red = Investment
- Green = Cost saving

Break even

Source: CORE/IMS based on newly diagnosed UKPDS cohort at age 52
Note: "better treatment" simulation of patient population treated to target of HbA1c = 7.0
John and Peter have just been diagnosed with diabetes – who will have the better life?

John
age 52
HbA1c 9.1%
Poor control

Peter
age 52
HbA1c 7.0%
Good control

Peter will have the better life
- Peter will live 20% longer than John
- Peter will live 60% longer without complications
- Peter will cost 20% less than John

John has poor control with HbA1c 9.1%, while Peter has good control with HbA1c 7.0%. Peter will have the better life in terms of longevity and complications.
The economic estimates of well-timed diagnostics and early treatment of type 2 diabetes mellitus in Lithuania (Markov model)

Results of timely diagnostics and early initiation of treatment:

- **Direct costs** per one patient **reduced**:
  - by 1,736 Lt over 5 years
  - by 5,911 Lt over 10 years

- **Indirect costs** per one patient **reduced**:
  - by 2,418 Lt over 5 years
  - by 7,061 Lt over 10 years

- **Health budget savings** (if diagnostics and early treatment improved in at least 50% of cases):
  - by 34,7 milion Lt over 5 years
  - by 118,2 milion Lt over 10 years

- **Prolonged life** of patient by 2,67 months over 10 years

Laiku diagnozuoto 2 tipo cukrinių diabeto ir anksti pradėto gydymo ekonominis įvertinimas Antanas Norkus, Rytas Ostrauskas, Rita Šulcaitė (Kauno medicinos universitetas Endokrinologijos institutas). Medicina (Kaunas) 2005; 41(10)
Modelling

- LEAD trials – data on 6-12 month treatment
- Modelling of long term outcomes and economic implications
- UKPDS and DCCT provides solid evidence linking surrogate markers (such as HbA$_{1c}$ and systolic blood pressure) to the development of the long-term complications associated with diabetes.
• health care services payer’s perspective (only direct health care costs and benefits for healthcare included).

• additional analysis from social perspective performed (including direct and indirect costs).
Time horizon and treatment duration

Base-case analysis:
• time horizon – 20 years (mean life expectancy of LEAD populations).
• patients are assumed to be treated for 5 years with the treatments being compared then treatment is switched to a basal insulin regimen (treatment intensification)
Input data

- Local collection
  - Cost data: drugs, strips, needles, screening, CVD, renal, eye and other microvascular complications, acute events
  - Indirect costs: age, gender and disease specific
  - Clinical management patterns (i.e. concomitant medications) and associated costs
  - Local experts involved

- Discounting:
  - local requirements/guidelines
  - base case: 5% for cost and effects
  - sensitivity analysis
Liraglutide Effect and Action in Diabetes:

- LEAD 1
- LEAD 2
- LEAD 5
- LEAD 6
  - 26-weeks randomised, double-blind, double-dummy, active control, multi-centre, multi-national trials.
LEAD 1

<table>
<thead>
<tr>
<th>PICO – study design</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Patients</strong></td>
</tr>
<tr>
<td><strong>Intervention</strong></td>
</tr>
<tr>
<td><strong>Comparator</strong></td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
</tr>
</tbody>
</table>
# Results - primary efficacy endpoint (HbA1c)

<table>
<thead>
<tr>
<th></th>
<th>Liraglutide 1,2 mg</th>
<th>Liraglutide 1,8 mg</th>
<th>Placebo</th>
<th>Rosiglitazone 4 mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITT Analysis Set, n</td>
<td>228</td>
<td>234</td>
<td>114</td>
<td>231</td>
</tr>
<tr>
<td>Baseline (Week 0), mean (SD)</td>
<td>8,5 (1,1)</td>
<td>8,5 (0,9)</td>
<td>8,4 (1,0)</td>
<td>8,4 (1,0)</td>
</tr>
<tr>
<td>Week 26, mean (SD)</td>
<td>7,4 (1,2)</td>
<td>7,4 (1,2)</td>
<td>8,6 (1,4)</td>
<td>7,8 (1,2)</td>
</tr>
<tr>
<td>ANCOVA</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change from Baseline to Week 26, (SE)</td>
<td>-1,1 (0,1)</td>
<td>-1,1 (0,1)</td>
<td>0,2 (0,1)</td>
<td>-0,4 (0,1)</td>
</tr>
<tr>
<td>ANCOVA estimated treatment differences</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Versus rosiglitazone p-value</td>
<td>-0,6 p&lt;0,0015</td>
<td>-0,7 p&lt;0,0001</td>
<td>NA</td>
<td>Comparatorder</td>
</tr>
</tbody>
</table>
# Results - primary efficacy endpoint (model clinical input)

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Liraglutide 1,2 mg (SD)</th>
<th>Liraglutide 1,8 mg (SD)</th>
<th>Rosiglitazone 4 mg (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in HbA$_{1c}$ (%)</td>
<td>-1,08 (1,057)</td>
<td>-1,13 (1,071)</td>
<td>-0,44 (1,064)</td>
</tr>
<tr>
<td>Change in systolic blood pressure (mmHg)</td>
<td>-2,56 (12,835)</td>
<td>-2,81 (13,155)</td>
<td>-0,93 (12,767)</td>
</tr>
<tr>
<td>Change in total cholesterol (mg/dL)</td>
<td>-5,06 (37,9)</td>
<td>-11,99 (38,549)</td>
<td>+7,42 (38,149)</td>
</tr>
<tr>
<td>Change in LDL (mg/dL)</td>
<td>-2,36 (29,746)</td>
<td>-8,09 (30,441)</td>
<td>+4,43 (29,941)</td>
</tr>
<tr>
<td>Change in HDL (mg/dL)</td>
<td>-0,84 (7,399)</td>
<td>-1,57 (7,649)</td>
<td>+0,75 (7,447)</td>
</tr>
<tr>
<td>Change in triglycerides (mg/dL)</td>
<td>-17,64 (132,273)</td>
<td>-14,74 (134,308)</td>
<td>+1,73 (134,052)</td>
</tr>
<tr>
<td>Change in BMI (kg/m²)</td>
<td>+0,119 (0,901)</td>
<td>-0,083 (0,862)</td>
<td>+0,77 (0,858)</td>
</tr>
<tr>
<td>Major hypo event rate (per 100 patient years)</td>
<td>0</td>
<td>0,9</td>
<td>0</td>
</tr>
<tr>
<td>Minor hypo event rate (per 100 patient years)</td>
<td>50,5</td>
<td>47,2</td>
<td>12,4</td>
</tr>
</tbody>
</table>
**Summary results of base-case analysis (LEAD 1, liraglutide 1,2 mg)**

<table>
<thead>
<tr>
<th></th>
<th>Lithuania</th>
<th>Romania</th>
<th>Czech Republic</th>
<th>Slovakia</th>
<th>Hungary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QALY, years</strong></td>
<td>6,632</td>
<td>6,430</td>
<td>7,391</td>
<td>6,675</td>
<td>6,668</td>
</tr>
<tr>
<td><strong>Costs, Euro</strong></td>
<td>15733</td>
<td>20,637</td>
<td>25,572</td>
<td>10,807</td>
<td>20,233</td>
</tr>
<tr>
<td><strong>Cost/QALY, Euro</strong></td>
<td><strong>17603</strong></td>
<td><strong>16,209</strong></td>
<td><strong>7,739</strong></td>
<td><strong>12,615</strong></td>
<td><strong>27,752</strong></td>
</tr>
<tr>
<td><strong>Threshold 1-3 GDP per capita,</strong></td>
<td>10000-30000</td>
<td>8500-25000</td>
<td>14000-42000</td>
<td>11000-33000</td>
<td>13300-40000</td>
</tr>
</tbody>
</table>
Sensitivity analysis - Scatter plot
(LEAD 1, liraglutide 1,2 mg; cost/QALY)
## CEA input data LEAD 6

### PICO – study design

<table>
<thead>
<tr>
<th>Patients</th>
<th>D2M treated with MET and/or SU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervention</td>
<td>liraglutide 1,8 mg</td>
</tr>
<tr>
<td>Comparator</td>
<td>Exenatide 10 ug twice daily</td>
</tr>
<tr>
<td>Outcome</td>
<td>HbA1c Safety profile</td>
</tr>
</tbody>
</table>
## Results - primary efficacy endpoint (HbA1c)

<table>
<thead>
<tr>
<th></th>
<th>Liraglutide 1,8 mg</th>
<th>Exenatide</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITT Analysis Set, n</td>
<td>233</td>
<td>231</td>
</tr>
<tr>
<td>Baseline (Week 0), mean (SD)</td>
<td>8,2 (1,0)</td>
<td>8,1 (1,0)</td>
</tr>
<tr>
<td>Week 26, mean (SD)</td>
<td>7,0 (0,9)</td>
<td>7,2 (1,0)</td>
</tr>
<tr>
<td><strong>ANCOVA</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Change from Baseline to Week 26,(SE)</td>
<td>-1,1 (0,1)</td>
<td>-0,8 (0,1)</td>
</tr>
<tr>
<td><strong>ANCOVA estimated treatment differences</strong></td>
<td></td>
<td>Comparator</td>
</tr>
<tr>
<td>Versus exenatide, non-inferiority</td>
<td>-0,3</td>
<td>Comparator</td>
</tr>
<tr>
<td>p-value</td>
<td>P&lt;0,0001*</td>
<td></td>
</tr>
<tr>
<td>Versus exenatide, superiority</td>
<td>-0,3</td>
<td>Comparator</td>
</tr>
<tr>
<td>p-value</td>
<td>p=0,0015*</td>
<td></td>
</tr>
</tbody>
</table>
### Results - primary efficacy endpoint (model clinical input)

<table>
<thead>
<tr>
<th>Risk factor</th>
<th>Liraglutide 1,8 mg (SD)</th>
<th>Exenatide 10 µg b.i.d. (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in HbA$_{1c}$ (%)</td>
<td>(-1,12 (1,221))</td>
<td>(-0,79 (1,216))</td>
</tr>
<tr>
<td>Change in systolic blood pressure (mmHg)</td>
<td>(-2,51 (17,554))</td>
<td>(-2,00 (17,934))</td>
</tr>
<tr>
<td>Change in total cholesterol (mg/dL)</td>
<td>(-7,69 (39,39))</td>
<td>(-3,54 (39,16))</td>
</tr>
<tr>
<td>Change in LDL (mg/dL)</td>
<td>(-17,13 (32,56))</td>
<td>(-15,53 (32,25))</td>
</tr>
<tr>
<td>Change in HDL (mg/dL)</td>
<td>(-1,37 (9,02))</td>
<td>(-1,74 (8,89))</td>
</tr>
<tr>
<td>Change in triglycerides (mg/dL)</td>
<td>(-36,42 (132,60))</td>
<td>(-20,16 (131,12))</td>
</tr>
<tr>
<td>Change in BMI (kg/m²)</td>
<td>(-1,145 (1,353))</td>
<td>(-1,015 (1,466))</td>
</tr>
<tr>
<td>Major hypo event rate (per 100 patient years)</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Minor hypo event rate (per 100 patient years)</td>
<td>193,2</td>
<td>260,0</td>
</tr>
</tbody>
</table>
### Summary results of base-case analysis (LEAD 6)

<table>
<thead>
<tr>
<th></th>
<th>Lithuania</th>
<th>Romania</th>
<th>Czech Republic</th>
<th>Slovakia</th>
<th>Poland</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>QALY, years</strong></td>
<td>LIRA 6,465</td>
<td>LIRA 6,340</td>
<td>LIRA 7,191</td>
<td>LIRA 6,486</td>
<td>LIRA 7,162</td>
</tr>
<tr>
<td><strong>Costs, Euro (ex. rate)</strong></td>
<td>17313</td>
<td>15565</td>
<td>21464</td>
<td>12797</td>
<td>12543</td>
</tr>
<tr>
<td><strong>Cost/QALY, Euro</strong></td>
<td>13925</td>
<td>15123</td>
<td>9693</td>
<td>24013</td>
<td>9441</td>
</tr>
<tr>
<td><strong>Threshold 1-3 GDP per capita, PPP’ Euro</strong></td>
<td>10000-30000</td>
<td>85000-25000</td>
<td>14000-42000</td>
<td>11000-33000</td>
<td>9300-28000</td>
</tr>
</tbody>
</table>
Incremental cost-effectiveness ratio for a drug X in Poland
Cost-effectiveness acceptability curve for a drug X in Poland

Acceptability Curve

Percentage Acceptable

Based on Life Expectancy
Based on QALY

Graph generated by IMS Core Diabetes Model
Conclusions

• For most cases (comparators and countries) liraglutide represented the „value for money”
• Unit costs of complications and management determine the cost-effectiveness of liraglutide
• Drug costs drive cost-effectiveness more in Eastern than Western European countries
• Inter-country variability needs to be further
Cost of reaching treatment results

To demonstrate the multiple clinical and economic benefits by using a composite clinical endpoint

Major guidelines:

• American Diabetes Association (ADA)
• Japanese Diabetes Society (JDS)
• European Association for the Study of Diabetes (EASD)
### Overview of treatment targets

<table>
<thead>
<tr>
<th>Indicator</th>
<th>ADA (US)</th>
<th>EASD (Europe)</th>
<th>JDS (Japan)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA\textsubscript{1c}</td>
<td>&lt;7.0%</td>
<td>≤ 6.5%</td>
<td>&lt;6.5%</td>
</tr>
<tr>
<td>Blood pressure</td>
<td>&lt;130/80</td>
<td>&lt;130/80</td>
<td>&lt;130/80</td>
</tr>
<tr>
<td>(mmHg)</td>
<td></td>
<td>In case of renal impairment: &lt;125/75</td>
<td></td>
</tr>
<tr>
<td>Weight</td>
<td>Weight loss is recommended for all overweight or obese individuals who have, or are at risk for, diabetes</td>
<td>Weight control BMI (kg/m\textsuperscript{2}) &lt;25 In case of overweight: weight reduction: 10%</td>
<td>Achieve a BMI=22 The immediate objective in obese individuals (BMI&gt;25) is to reduce current weight by 5%</td>
</tr>
<tr>
<td>Lipids</td>
<td>LDL &lt;2.6 mmol/L</td>
<td>TC &lt;4.5 mmol/L LDL ≤1.8 mmol/L HDL (men) &gt;1.0 mmol/L HDL (women) &gt;1.2 mmol/L TG &lt;1.7 mmol/L</td>
<td>TC &lt;200 mg/dL (if CAD, &lt;180 mg/dL) LDL &lt;120 mg/dL (if CAD, &lt;100 mg/dL) HDL ≥40 mg/dL</td>
</tr>
</tbody>
</table>

BMI, body mass index; TC, total cholesterol; LDL, low-density lipoprotein; HDL, high-density lipoprotein; TG, triglycerides; CAD, coronary artery disease; ESC, European Society of Cardiology
Definition of two composite endpoints

Composite endpoint 1:
- $\text{HbA}_{1c}<7.0\%$ +
- no weight gain +
- no confirmed hypoglycaemia (minor or major)

Composite endpoint 2:
- $\text{HbA}_{1c}<7.0\%$ +
- no weight gain +
- $\text{SBP}<130\ \text{mmHg}$

SBP, systolic blood pressure

Of clinical and patient interest

Includes three goals set by ADA 2009 Standards of Care
Liraglutide vs. other therapies: odds ratio of obtaining composite endpoint  

HbA<sub>1c</sub>&lt;7.0%, no weight gain and no minor or major hypoglycaemia  

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Odds ratio favouring liraglutide 1.8 mg</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liraglutide 1.8 mg vs. TZD</td>
<td>10.3***</td>
</tr>
<tr>
<td>Liraglutide 1.8 mg vs. SU</td>
<td>7.3***</td>
</tr>
<tr>
<td>Liraglutide 1.8 mg vs. glargine</td>
<td>3.7***</td>
</tr>
<tr>
<td>Liraglutide 1.8 mg vs. exenatide</td>
<td>2.0**</td>
</tr>
</tbody>
</table>

**p&lt;0.01; ***p&lt;0.001 in favour of liraglutide 1.8 mg  
Based on meta-analysis of LEAD 1–6. Adjusted for previous treatment, baseline values and randomisation LOCF, ITT
Liraglutide vs. other therapies: odds ratio of obtaining composite endpoint

$\text{HbA}_1c < 7.0\%$, no weight gain and no minor or major hypoglycaemia

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Odds ratio favouring</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liraglutide 1.2 mg vs. TZD</td>
<td>7.5***</td>
</tr>
<tr>
<td>Liraglutide 1.2 mg vs. SU</td>
<td>5.3***</td>
</tr>
<tr>
<td>Liraglutide 1.2 mg vs. placebo</td>
<td>5.3***</td>
</tr>
</tbody>
</table>

**$p<0.01$; ***$p<0.001$ in favour of liraglutide 1.2 mg**

Based on meta-analysis of LEAD 1–6. Adjusted for previous treatment, baseline values and randomisation LOCF, ITT
From cost to value of treatment

• Why is it relevant for physicians and budget holders to consider the value of drugs?
  – Comparing drugs on price alone is like comparing apples and oranges – treatment effect must be taken into account
  – Many prescribers feel a push to prescribe the cheapest drug, but the cheapest drug might not be the best

• The composite treatment success results can be expressed in economic terms by comparing the cost of two treatments with the outcomes
Drug costs

• The following costs are included in the cost of treatment:

  – Active drug (liraglutide or comparator) based on end-of-trial dose
  – Combination drugs based on end-of-trial dose
  – Metformin and SU prices based on generic drugs
  – SMBG costs (normal use by patient type based on Roper Starch 2007 data). Use in liraglutide is per label (no additional SMBG needed)
  – Cost of needles, where relevant
  – Drug prices for Germany
Euro spent to bring patients to target of HbA$_{1c}$ < 7.0% with no hypoglycaemia and no weight gain

Euro spent on comparators to bring patients to target for every Euro spent on a drug X
Liraglutide 1.2mg: Euro spent to bring patients to target of HbA$_{1c}$ <7.0%, SBP<130mmHg and no weight gain

Euro spent on comparators to bring patients to target for every Euro spent on liraglutide 1.2 mg

- SU
- TZD
- Glargine (indirect)
- Exenatide (indirect)
- Victoza® 1.2 mg
Victoza® 1.8mg: Euro spent to bring patients to target of HbA

\[ \text{HbA}_1c < 7.0\% \] with no hypoglycaemia and no weight gain

Euro spent on comparators to bring patients to target for every Euro spent on Victoza® 1.8 mg

- SU: 0.76
- TZD: 2.05
- Glargine: 1.14
- Exenatide: 1.11
- Victoza® 1.8 mg: 1.00
Victoza® 1.8mg: Euro spent to bring patients to target of HbA$_1^c$ <7.0%, SBP<130mmHg and no weight gain

Euro spent on comparators to bring patients to target for every Euro spent on Victoza® 1.8 mg

- SU: 0.55
- TZD: 2.7
- Glargine: 2.11
- Exenatide: 1.22
- Victoza® 1.8 mg: 1.00
Conclusion: Cost of Diabetes Control

• Liraglutide is clinically superior and brings more patients’ diabetes under control at a lower combined cost than exenatide, rosiglitazone and insulin glargine (and sitagliptin)

• Sulphonylureas bring more patients in control at lower cost. The main driver of this is the low cost of generic SU, not treatment success (less than 1 in 10 patients get in control)
Is it enough to marry a soldier to be effectively protected from diabetes mellitus and its complications?

Thank you for your attention