Comparing three indirect cost approaches in the IQVIA Core Diabetes Model

EE470

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Background

- Morbidity and mortality results in absent days from work and consequent salary losses.
- Indirect costs reflect loss of productivity and its prediction over time measures the burden of the disease from a societal perspective. The inclusion of indirect costs in cost-effectiveness analyses may impact its outcomes.
- The IQVIA Core Diabetes Model (CDM) [1,2] is a widely published and validated [3] lifetime cost-effectiveness simulation model, that assesses health and economic outcomes in patients with type 1 or type 2 diabetes.
- In the CDM, two approaches for indirect cost calculation are available, and three options to handle indirect costs due to mortality were included in CDM v10.0.

Objectives

- The aim of this study is to compare total costs and net monetary benefits (NMB) using different indirect cost approaches and options for handling indirect costs due to mortality in the CDM.

Methods

- In CDM v10.0 two approaches are available for indirect cost prediction: the human capital approach (HCA) and the friction method (FM).
- In the HCA, indirect costs are calculated as salary loss for each day of absence due to morbidity or mortality.
- Indirect costs are calculated the same way in the FM. However, this method considers that workers can be replaced, thus only accounting the days of salary loss until time of replacement is reached.
- Mortality of patients within the country's labor force leads to loss of productivity until age of retirement or replacement (depending in the indirect costs approach). Three options to handle indirect costs due to mortality are available in CDM v10.0:

  Option 1: Indirect costs from the moment the patient dies are excluded (default CDM option)

  Option 2: Indirect costs from the moment the patient dies are included, even if patients dies before age of first salary. This option is not available when using the FM.

  Option 3: Indirect costs from the moment the patient dies are included, but only if the patient dies after age of first salary.

- Eighty-year analyses were performed on a hypothetical type-1 diabetes cohort with baseline age of 12 years, hemoglobin A1c (HbA1c) of 8%, diabetes duration 5 years, proportion of males 46.4%, and BMI 18.6 kg/m2. Cohort characteristics are presented in Table 1.

Table 1 – CDM Cohort inputs

Parameter	Values
HbA1c	8 %
Start age	12 years
Duration of diabetes	5 years
Proportion male	46.4%
SBP	108.0 mmHg
DBP	63.8 mmHg
Total cholesterol	180.1 mg/dL
HDL	61.6 mg/dL
LDL	100 mg/dL
Triglycerides	93.3 mg/dL
BMI	18.6 kg/m^2
eGFR	97.8 mL/min/1.73m^2

HbA1c: hemoglobin A1c, SBP: Systolic blood pressure, DBP: Diastolic blood pressure, HDL: High-density lipoprotein cholesterol, LDL: Low-density lipoprotein cholesterol, BMI: Body mass index, eGFR: Estimated glomerular filtration rate

- Treatment effect of -1%-point in HbA1c was compared to no treatment.
- Analyses were performed using French population data (Table 2) considering a hypothetical willingness to pay threshold of 30,000 € per quality adjusted life year increase.
- The Pittsburgh 2018 cardiovascular risk equation was used.
- Analyses were performed using the HCA, FM, and the 3 options for indirect costs due to mortality.

Table 2 – CDM inputs for indirect cost calculations

Parameter	Value
Retirement age	62 years
Age at first salary	18 years
Mean salary for males	22,788 €
Mean salary for females	19,668 €
Number of work-days per year	220 days
Labor force participation rate[1]	73.9%
Discount rate	1.5%
Time until replacement[2]	90 days

1: proportion of the working-age population contributing to the labor force, 2: only applied in the FM

Results

- Predicted quality adjusted life years were higher in the treated arm compared to the non-treated arm.
- Using the HCA, with all options, the predicted combined costs were higher in the non-treated arm (Table 3).
- Comparing option 2 and option 3 with option 1, combined total costs increased in both arms, as a consequence of including indirect costs due to mortality.
- Given the additional indirect costs with option 2 and option 3, savings augmented in the two cases, leading to a rise of the NMB.
- Similar values were predicted with options 2 and 3. The small difference between these options is that option 2 adds the indirect costs of patients before entering the work force.

Table 3 – Predicted costs and NMB using HCA

	Option 1		Option 2		Option 3	
	Treated arm	Untreated arm	Treated arm	Untreated arm	Treated arm	Untreated arm
Indirect costs (€)	34,595	43,528	107,377	124,148	103,675	119,927
Combined costs (€)	199,964	233,357	272,745	313,976	269,044	309,756
Δ Combined costs (€)	-33,393		-41,231		-40,712	
NMB (€)	76,383		84,221		83,702	

NMB: Net monetary benefit

- Predicted total costs using the FM were higher for the untreated arm, regardless of option selected (Table 4).
- As the replacement is assumed already after 90 days, the indirect costs when using option 1 or 3 are similar.

Table 4 – Predicted costs and NMB using FM

	Option 1		Option 3	
	Treated arm	Untreated arm	Treated arm	Untreated arm
Indirect costs (€)	33,134	41,026	34,210	42,210
Total costs (€)	198,502	230,854	199,579	232,039
Δ Total costs (€)	-32,352		-32,460	
NMB (€)	75,342		75,450	

NMB: Net monetary benefit

Conclusions

The indirect costs due to mortality increase the total combined costs considerably and rise the economic value of the best therapy.

Mortality before the age of first salary slightly increases the costs, with minimal impact on cost-effectiveness results.

The impact of including mortality in the FM barely impacts final outcomes.

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ISPOR Congress, November 12-15 2023, Copenhagen, Denmark. Poster EE470.

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