Mount Hood 2025 - Reference Simulation

(Type 2 Diabetes)

Mt Hood Reference Simulation

The modelling groups are asked to repeat the reference simulations for the representative patient in the Mt Hood Reference case (as reported in the Mt Hood model registry and specified below). This will enable model simulations to be compared across time—incorporating model upgrades for those that have completed these previously—and these values will be used to update the model registry: https://www.mthooddiabeteschallenge.com/registry.

Model inputs for Challenge – Reference Simulation

Patient Baseline Characteristics

To allow for consistent comparisons across all models, baseline patient characteristics should follow the values as listed in Table 2. Any other baseline patient characteristics that your model may require can be sourced from publicly available literature (but please document this including sources in "Baseline Characteristics" tab in the accompanying Excel spreadsheet).

Table 1: Patient Baseline Characteristics

Patient Characteristics	**Type 2 diabetes[a]**	
	Men	**Women**
Current age	66	66
Duration of diabetes	8	8
Current/former smoker	N	N
Ethnicity	White	White
HbA1c. %	7.5	7.5
Systolic Blood Pressure, mmHg	145	145
Diastolic Blood Pressure, mmHg	80	80
Total Cholesterol, mmol/l	5.2	5.2
HDL Cholesterol, mmol/l	1.3	1.3
LDL Cholesterol, mmol/l	3.0	3.0
Triglycerides, mmol/L	2.0	2.0
BMI	28	28
Albumin: creatinine ratio	14.2	14.2
PVD	N	N
Micro or macro albuminuria (albuminuria >50)	N	N
Atrial fibrillation	N	N
eGFR (ml/min/1.73 m2)	70	70

WBC (x10^9/l)	7	7
Heart rate (bpm)	79	79
Haemoglobin (g/dl)	14	14
Prior history of macrovascular disease	N	N
Prior history of microvascular disease	N	N

Source: [a]ADVANCE—Action in Diabetes and Vascular Disease: patient recruitment and characteristics of the study population at baseline; see Appendix 1 for summary table

Utility Values

The reference simulation uses the health utility values from the 2018 Mt Hood Quality of life Challenge for type 2 diabetes (Table 1). It will be adequate to use point estimates and not model second order uncertainty if the model allows it.

If you require additional utility weights for health states not listed, please add utility values you currently use. Please document your sources and assumptions in the "Utility values" tab in the accompanying Excel spreadsheet.

For the challenge, please apply disutility values only to complication events described in the instructions as far as possible. If this is not possible and your model **requires** you to apply additional disutilities for certain health states (e.g. a raised BMI health state which is independent of BMI's effect on complication events) - please report these disutilities here. Please also keep baseline utilities constant across all ages as set out in instruction table 1. Where possible, please do not change baseline utilities by age. However, if your model requires you to do so – please report this in the Excel sheet.

Note: please make sure to avoid confusion with utility/disutility terminology in loading the models and in reporting results. The "Utility/Disutility Values" column in Table 1 reports "utility" only for diabetes without complication (which is positive). The remaining items (all negative) are disutility and are incremental.

Based on the 2018 Mt. Hood challenge conference call on September 5, 2018, two suggestions were made for the Quality of Life challenge, including:

1) The additive quality-of-life (QoL) model is recommended when populating the health utility values into the simulation model. As shown in Table 1 below, if a subject has experienced two different complications belonging to 2 different categories of disease (e.g., stroke [in the category of cerebrovascular disease] and myocardial infarction [in the category of coronary heart disease]), the health utility value will be reduced by 0.219 which is the sum of individual decrement for these 2 complications (i.e., 0.164+0.055). However, if a subject has experienced two or more complications

within the same category of disease (e.g., myocardial infarction [in the category of coronary heart disease] and congestive heart failure [in the category of coronary heart disease]), the health utility value will be reduced by 0.108 (the decrement for heart failure) which is the largest decrement of these two complications. If the additive QoL model is not feasible in your model, please document your assumptions how the health utility values are populated in your model.

2) The utility decrement and its 95% confidence interval for renal transplant was assumed to be half of those for hemodialysis.

Table 2. Utility values by categories of diseases/complications

Disease category	Complication level provided in Mt. Hood QoL challenge	Type 2 diabetes [a]		
		Utility/Disutility Values	Lower 95% CI	Upper 95% CI
Baseline utility value	Diabetes without complications	0.785	0.681	0.889
Acute metabolic disorder	Minor hypoglycemia event	-0.014	-0.004	-0.004
	Major hypoglycemia event	-0.047	-0.012	-0.012
Comorbidity	Excess BMI (each unit above 25 kg/m^2)	-0.006	-0.008	-0.004
Retinopathy	Cataract	-0.016	-0.031	-0.001
	Moderate non-proliferative background diabetic retinopathy	-0.040	-0.066	-0.014
	Moderate macular edema	-0.040	-0.066	-0.014
	Vision-threatening diabetic retinopathy	-0.070	-0.099	-0.041
	Severe vision loss	-0.074	-0.124	-0.025
Nephropathy	Proteinuria	-0.048	-0.091	-0.005
	Renal transplant[1]	-0.082	-0.137	-0.027
	Hemodialysis	-0.164	-0.274	-0.054
	Peritoneal dialysis	-0.204	-0.342	-0.066
Neuropathy	Peripheral vascular disease	-0.061	-0.090	-0.032
	Neuropathy	-0.084	-0.111	-0.057

	Active ulcer	-0.170	-0.207	-0.133
	Amputation event	-0.280	-0.389	-0.170
Cerebrovascular disease	Stroke	-0.164	-0.222	-0.105
Coronary heart disease	Myocardial infarction	-0.055	-0.067	-0.042
	Ischemic heart disease	-0.090	-0.126	-0.054
	Heart failure	-0.108	-0.169	-0.048

Source: [a] Beaudet et al. 2014 (1). Abbreviations: QoL, quality of life; CI, confidence interval; BMI, body mass index. [1]The utility decrement and its 95% confidence interval for renal transplant was assumed to be the half of those for haemodialysis.

* Compiled by An Tran-Duy (an.tran@unimelb.edu.au) on behalf of the COSMO-T1D modelling group. Note that the 95% CIs were not reported in Hart et al (source: d) and Ahola et al (source: e) and were reconstructed based on t-value, p-value, sample size and/or standard error where relevant.

Reference Simulation - Instructions

Step 1: Run a simulation using the baseline risk factors from Table 2 held constant over a 40-year period for type 2 diabetes, separately for males and for females

This simulation should match both the 2018 Mt Hood challenge and the reference case simulations which are on the Mt Hood website: (https://www.mthooddiabeteschallenge.com/refsim). Ensure QALYs are **not discounted** for this challenge.

Extract the results and enter input values in a transparent manner in the accompanying Excel workbook in tab labelled "Time paths & Outcomes" (modify the workbook to fit your outcomes if necessary, but please try to preserve the basic structure). Do not forget to include traces (risk factor time paths) for input values of all the above risk factors; rates (or counts) of all major health states in the model (e.g. MI; stroke; renal failure, etc.), and life-expectancy.

For microsimulation models, please ensure that the number of replications is sufficient to generate stable results. Report how many replications were used.

Step 2: Reference simulation of common treatment effects

Re-run the simulation with four individual interventions (one-at-a-time and then all combined), separately for males and females, that capture initial and permanent reductions in common risk factors from time paths modelled in Step 1. Reductions from these interventions should only be applied to post-baseline cycles and baseline values should remain unchanged.

(i) 0.5%-point reduction in HbA1c;

(ii) 10mm Hg reduction in Systolic Blood Pressure;

(iii) 0.5 mmol/l (19.33 mg/dl) reduction in LDL Cholesterol

(iv) 1-unit reduction in BMI (kg/m2)

(v) All 4 of the interventions above applied simultaneously#

Extract the results and add to the accompanying Excel workbook (in tab labelled "Time paths & Outcomes". Report outcomes and inputs in a transparent manner. Do not forget to include traces (numerical or curves) for input values of all the above risk factors; cumulative rates (or counts) of all major health states in the model (e.g. MI; stroke; renal failure, etc.) and life expectancy.

Step 3: Estimate incremental QALYs, separately for males and females

Using the "Utility/disutility" values in Table 1 run the baseline simulation and estimate expected QALYs, assuming that decrements apply to the year of the of the event and are similarly applied to each subsequent year. However, if temporary events/states such as hypoglycaemia are modelled, it is likely that these decrements only apply to the year of the event. If so, please document this.

Run each of the four interventions listed in Step 2 to estimate the expected QALYs and calculate the incremental QALYs compared to the baseline (control). Extract the results and add to the accompanying Excel workbook (in tab labelled "Time paths & Outcomes").

Be sure to report incremental QALYs so that a negative value indicates worse QALYs (not inverting to account for a positive value indicating more disutility)

Step 4: Report constant risk factor results

Extract the results and add to the accompanying Excel workbook (in tab labelled "Time paths & Outcomes". Report outcomes and inputs in a transparent manner. Do not forget to include traces (numerical or curves) for input values of all the above risk factors; cumulative rates (or counts) of all major health states in the model (e.g. MI; stroke; renal failure, etc.). Please provide total and increment LYs and QALYs in the tab *Results – Step 4.*

Step 5: Time-varying risk factors

Re-run steps 1-3, this time using the time-varying risk factor values derived using Gao et al. (2024). Time paths have been estimated for continuous variables and eGFR (see *Time paths & Outcomes - Step 5*). Note, White Blood Cell counts were estimated using Leal et al (2020) and binary variables are assumed to be Last Value Carried Forward.

*If your model only allows drift assumptions, and not specific values, over time, then calculate the average risk factor growth rate for each risk factor from the provided time paths in *Time paths & Outcomes - Step 5*. Please record the assumption within the *Time paths & Outcomes - Step 5* tab.

Step 6: Report time-varying risk factors results

Extract the results and add to the accompanying Excel workbook (in tab labelled "Time paths & Outcomes". Report outcomes and inputs in a transparent manner. Do not forget to include traces (numerical or curves) for input values of all the above risk factors; cumulative rates (or counts) of all major health states in the model (e.g. MI; stroke; renal failure, etc.). Please provide total and increment LYs and QALYs in the tab *Results – Step 6.*

Submission:

Prior to the meeting, please submit the Excel spreadsheet ("MH CHICAGO CHALLENGE – REFsimulation_GROUP") to Mount Hood at: mthood2016@gmail.com **by 15 June 2025.** Please replace GROUP with your modelling group name before submission.