Draft Challenge Instructions

(Updated - 2 Sept 2026)

2026 Mount Hood T1DM Diabetes Challenge:

Evaluation of the Economic Value of Presymptomatic Screening in Type 1 Diabetes

1 INTRODUCTION

Background:

Presymptomatic screening for type 1 diabetes (T1D) has become increasingly relevant following advances in the understanding of T1D as a progressive disease and the development of therapies capable of delaying progression to clinical disease. Together, these developments have shifted attention toward earlier identification and intervention, and several countries— including the UK, the US, and Germany, as well as via global collaborations such as EDENT1FI—are now evaluating screening strategies for individuals at risk of T1D, creating a need to evaluate the long-term clinical and economic consequences of presymptomatic screening.

Many of the potential benefits and costs of presymptomatic screening extend over decades and cannot be directly observed within available clinical studies. Decision-analytic models therefore play a central role in synthesizing available evidence and projecting long-term clinical and economic outcomes to inform healthcare decision-making.

The Mount Hood Diabetes Challenge Network brings together developers and users of diabetes simulation models to address common decision problems using independently developed models. By systematically comparing model predictions, assumptions, and methods, the Mount Hood Network promotes methodological learning and continuous model improvement, with the ultimate goal of strengthening the credibility of model-based evidence for healthcare decision-making.

Challenge Objectives:

- Collaboratively evaluate the long-term clinical and economic consequences of presymptomatic screening for T1D by addressing a common decision problem using independently developed diabetes simulation models
- Compare predictions from independently developed diabetes simulation models addressing a common decision problem to better understand the influence of model structure, assumptions, and implementation on predicted outcomes
- Identify opportunities to improve diabetes simulation models and strengthen the credibility of model-based evidence for healthcare decision-making through systematic comparison and methodological learning, including improving our understanding of different T1D screening models and how the implementation of costs, health utilities, choice of risk equations, and model assumptions impact model outcomes

Research Questions:

- What are the predicted long-term clinical and economic consequences of presymptomatic screening for T1D compared with no screening?
- To what extent do independently developed diabetes simulation models produce consistent estimates when addressing the same decision problem?

- What insights from systematic comparison of independently developed models can be used to improve diabetes simulation models and strengthen the credibility of model-based evidence for healthcare decision-making?

2 CHALLENGE OVERVIEW

- Decision Problem: Evaluate the long-term clinical and economic consequences of presymptomatic screening for T1D compared with no screening
- Target Population: 8-year old children in the general population
- Comparison
  - Intervention: Screening for T1D-associated autoantibodies, including confirmatory testing for individuals with a positive initial screening result (96%/98% Sensitivity and specificity of initial screening and 100%/100% Sensitivity and specificity of confirmatory screening)
  - Comparator: No screening
- Reference Country: France
- Analytic Perspective: Healthcare and Societal
- Time Horizon: Lifetime
- Outcomes: Number of avoided diabetes-related complications, life years, QALYs, direct costs, indirect costs, and cost-effectiveness of T1D screening.
- Cost Year: 2025
- Discount Rate: 2.5% annually for both costs and health outcomes

3 CHALLENGE INSTRUCTIONS

Participants should implement the challenge specifications described in this section using their own independently developed T1D screening models. Unless otherwise specified, participants should implement the challenge as closely as possible while preserving their model's established methods. Where exact implementation is not feasible, participants should use the closest available implementation and document any material assumptions, adaptations, or deviations in the reporting documents.

Step 1. Load model with general population characteristics

Populate the model using the average baseline characteristics of the general population undergoing screening specified in Table 1. Use cohort-level values if possible, rather than applying patient heterogeneity. Where a baseline characteristic cannot be represented directly within a model, participants should use the closest available representation and document any assumptions or deviations.

Table 1 Baseline characteristics of the population at screening

Parameter	Value	Source
Proportion female	50.3%	McQueen et al. (2020)
Starting age (years)	8	EDENT1FI data on file
Prevalence of multiple IAbs	0.473%	EDENT1FI data on file

Parameter	Value	Source
T1D stage at baseline for individuals with multiple IAbs	Stage 1: 80% Stage 2: 20%	EDENT1FI data on file

Step 2. Configure the screening strategy

Implement the screening strategy according to the specifications provided in Table 2. The screening strategy should include all components specified in the challenge, including the initial screening strategy, confirmatory testing, and monitoring of stage 1/2 T1D. Where the model cannot represent the screening pathway exactly, participants should implement the closest feasible representation and document any deviations.

The screening strategy is applied once to the entire general population cohort at age 8, with the exclusion of individuals with diagnosed stage 3 T1D, who are assumed to have been clinically diagnosed. No repeat population screening is modelled. The prevalence inputs in Table 1 determine the proportion of individuals with islet autoantibodies at the time of the age-8 screen. Individuals who do not have screen-detectable presymptomatic T1D at age 8 do not subsequently enter the screening-detected monitoring pathway, even if they develop islet autoimmunity later.

Table 2 Screening and monitoring parameters

Parameter	Value	Source
Sensitivity and specificity of initial screening	96% / 98%	Marzinotto et al. (2026)
Sensitivity and specificity of confirmatory screening	100%/100%	Assumption
Stage 1/2 monitoring duration	Until Stage 3 onset or age 18, whichever occurs first	Assumption

Step 3. Configure T1D progression and Stage 3 characteristics

Progression between Stage 1, Stage 2, and Stage 3 T1D should be simulated using the transition probabilities specified in Table 3.. Screening and subsequent monitoring are assumed not to alter the natural history or timing of progression from Stage 1 or Stage 2 to Stage 3 T1D.

Table 3 T1D Progression and DKA at Stage 3 onset

Parameter	Value	Source
Annual transition probability from Stage 1 to Stage 2	0.123	Fr1da data on file
Annual transition probability from Stage 2 to Stage 3	0.200	Fr1da data on file
Proportion with DKA at stage 3 onset without monitoring	46%	McQueen et al. (2020)
Proportion with DKA at stage 3 onset during monitoring	3.22%	Schneider et al. (2023) and Hummel et al. (2023)

At Stage 3 T1D onset, populate the model using the Stage 3 T1D characteristics specified in Table 4. These parameters are based on the 2022 Mount Hood Diabetes Challenge and should be held constant

throughout the remainder of the simulation, except for the HbA1c effects specified in Step 4. Where possible, cohort-level means should be used rather than patient-level heterogeneity. Where a Stage 3 characteristic cannot be represented directly within a model, participants should use the closest available representation and document any assumptions or deviations.

Following Stage 3 T1D onset, the clinical management pathway is not modelled explicitly. Risk factors are assumed to remain constant, except for the effects associated with early detection, monitoring, and DKA at Stage 3 onset, as specified in Step 4.

For individuals who never develop Stage 3 T1D during the simulation, the development of T2D and other diseases is outside the scope of this challenge and should not be modelled explicitly. These events are assumed to be independent of the T1D screening strategy and therefore to occur equally in the screening and no-screening arms.

Table 4 Stage 3 T1D characteristics

Parameter	Value	Source
Current/former smoker, %	0/0	Assumption
HbA1c, %	8.1	Tran-Duy et al 2020
Systolic Blood Pressure, mmHg	127	Tran-Duy et al 2020
Diastolic Blood Pressure, mmHg	73	Tran-Duy et al 2020
Total Cholesterol, mmol/l	4.8	Tran-Duy et al 2020
HDL Cholesterol, mmol/l	1.6	Tran-Duy et al 2020
LDL Cholesterol, mmol/l	2.7	Tran-Duy et al 2020
Triglycerides, mmol/L	1.2	Tran-Duy et al 2020
BMI	25	Tran-Duy et al 2020
Estimated glomerular filtration rate, mL/min/1.73 m^2	96	Tran-Duy et al 2020

Step 4. Load consequences of monitoring screening-detected Stage 1 or Stage 2 T1D (e.g., HbA1c effect, AEs) according to Table 5. Two HbA1c effects are modelled, one associated with monitoring during onset of stage 3, and one associated with DKA at onset. Monitoring of stage 3 onset is also assumed to affect the risk of DKA at onset.

The modelling groups are asked to implement the effects in separate simulations representing three distinct scenarios (A, B and C):

A. 0.4% reduction in HbA1c for 5 years after stage 3 onset during monitoring after screening detection (Lundgren et al, 2019). After 5 years, the effect is reverted back to baseline. Applied to all patients with monitored onset of stage 3.

B. 0.45% increase in HbA1c for 17 years after stage 3 onset with DKA (Duca et al, 2017). After 17 years, the effect is reverted back to baseline. Applied to all patients with DKA at onset of stage 3.

C. The 2 effects above applied simultaneously.

    i. For a monitored onset of stage 3 with DKA, this means an initial effect of +0.05% [-0.4%+0.45%], followed by + 0.40% after 5 years, followed by reversion to baseline after another 12 years. The resulting HbA1c trajectory is: 8.15% during 5 years, 8.55% during the next 12 years, and then 8.1% during the remainder of the simulation.

No other intensifications or changes to other risk factors are modelled.

Table 5 Consequences of monitoring screening-detected T1D

Parameter	Value	Source
HbA1c effect associated with monitoring stage 3 onset (Applied in Scenario A and C)	-0.4%	Lundgren et al, 2019 (Average difference during follow up)
Duration of HbA1c effect associated with monitoring stage 3 onset	5 years	Length of follow up in Lundgren et al, 2019
HbA1c effect associated with DKA at onset of stage 3 (Applied in Scenario B and C)	+0.45%	Duca et al, 2017
Duration of HbA1c effect associated with DKA at onset of stage 3	17 years	Length of follow up in Duca et al, 2017
Proportion with DKA at stage 3 onset without monitoring	46%	McQueen et al. (2020)
Proportion with DKA at stage 3 onset during monitoring	3.22%	Schneider et al. (2023) and Hummel et al. (2023)

Step 5. Load QALYs

Load the model with your utility parameters specified in Table 6. Unless otherwise specified, participants should apply the challenge specifications while retaining their model's established methods for simulating clinical outcomes. If you require utility weights for additional health states not listed, please add utility values you currently use. Please document your sources and assumptions. Please also keep baseline utilities constant across all ages. Where possible, please do not change baseline utilities by age. However, if your model requires you to do so – please document your sources and assumptions. The additive quality-of-life (QoL) model is recommended. 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.

Table 6 Baseline utilities and disutility values associated with T1D complications

Category	Health state/event	Utility/disutility value	Source
Baseline utility value	No T1D	0.825	Assumption
	T1D without complications	0.825	HAS (2024)
CVD	MI event	−0.081	HAS (2024)
	Post-MI health state	−0.081	HAS (2024)
	Revascularisation event	−0.099	HAS (2024)
	Post-revascularisation health state	−0.081	HAS (2024)
	Angina health state	−0.080	HAS (2024)
	Heart failure health state	−0.099	HAS (2024)
	Stroke event	−0.132	HAS (2024)
	Post-stroke health state	−0.132	HAS (2024)
Cataracts	Cataract surgery event	−0.022	HAS (2024)
	Cataracts, partially sighted health state	−0.022	HAS (2024)
Neuropathy	Peripheral neuropathy health state	−0.283	HAS (2024)
	Peripheral vascular disease health state	−0.081	HAS (2024)
	Lower-extremity amputation event	−0.095	HAS (2024)

Category	Health state/event	Utility/disutility value	Source
	Amputee health state	−0.004	HAS (2024)
	Foot ulcer health state	−0.075	HAS (2024)
Nephropathy	Microalbuminuria health state	−0.084	HAS (2024)
	Proteinuria health state	−0.084	HAS (2024)
	ESRD health state	−0.115	HAS (2024)
Retinopathy	PDR health state	−0.022	HAS (2024)
	Macular oedema health state	−0.022	HAS (2024)
	Blindness / SVL health state	−0.076	HAS (2024)
Hypoglycaemia	Hypoglycaemia	−0.006	HAS (2024)
DKA	DKA	−0.0165	Peasgood et al. (2016)

Step 6. Load unit costs for direct medical costs and lost labor market productivity

Load the model with your cost parameters specified in Table 7 and Table 8. If you require additional cost inputs for health states or complications not listed, please add the costs you currently use and report any additional costs separately. Please document your sources and assumptions. For cost of DKA at onset, please add the event cost of DKA in Table 8.

Table 7 Costs of screening, monitored stage 1/2, and stage 3 onset

Item	Unit cost (EUR 2025)	Source
Screening	€27.84	Karl et al. (2022)
Confirmatory screening test	€10.48	Karl et al. (2022)
Monitoring stage 1 (state cost)	€60.75	Average annual cost of monitoring for screening-detected stage 1, with random plasma glucose and HbA1c assessment in clinic (Gillet et al. 2015, assuming 1 per year) and dysglycaemia assessment (Farrar et al. 2016, based on cost of OGTT, assuming 1 per year)
Monitoring stage 2 (state cost)	€133.9	Average annual cost of monitoring for screening-detected stage 2, with random plasma glucose and HbA1c assessment in clinic (Gillet et al. 2015, assuming 4 per year) and home glucose assessment (Farrar et al. 2016, assuming 6 per year)
Stage 3 onset without complications (event cost)	€5,433	EDENT1FI data on file
Reduction in cost of Stage 3 onset without complications due to monitoring	75%	Assumption
Labor market productivity loss for parents/caregivers following a stage 3 diagnosis without monitoring	1% (applied for 1 year)	Kennedy et al. (2025)

Item	Unit cost (EUR 2025)	Source
Annual income of parents/caregivers	€55,000	Kennedy et al. (2025)

Table 8 Costs of T1D complications

Category	Health state/event	Unit cost (EUR 2025)	Source
CVD	MI event	€17,107.48	HAS (2024)
	Post-MI health state	€1,330.69	HAS (2024)
	Revascularisation event	€4,212.95	HAS (2024)
	Post-revascularisation health state	€357.97	HAS (2024)
	Angina (year 1) health state	€7,864.46	HAS (2024)
	Angina (year 2+) health state	€611.49	HAS (2024)
	Heart failure (year 1) health state	€4,212.74	HAS (2024)
	Heart failure (year 2+) health state	€2,061.76	HAS (2024)
	Stroke event	€1,822.49	HAS (2024)
	Post-stroke health state	€884.59	HAS (2024)
	Stroke death event	€7,700.16	HAS (2024)
Cataracts	Cataract surgery event	€1,566.80	HAS (2024)
	Cataracts, partially sighted health state	€43.52	HAS (2024)
Neuropathy	Peripheral neuropathy health state	€208.91	NHS (2010)
	Peripheral vascular disease health state	€357.95	HAS (2024)
	Lower-extremity amputation event	€13,176.34	HAS (2024)
	Amputee health state	€1,830.11	HAS (2024)
	Foot ulcer health state	€1,330.69	HAS (2024)
Nephropathy	ESRD (year 1) health state	€91,815.47	HAS (2024)
	ESRD (year 2+) health state	€21,591.35	HAS (2024)
Retinopathy	PDR (year 1) health state	€208.91	HAS (2024)
	PDR (year 2+) health state	€208.91	HAS (2024)
	Blindness / SVL health state	€14,361.23	HAS (2024)
Severe hypoglycaemia event		€240.07	HAS (2024)
DKA event		€2,550.00	CHU Orleans (2025)
T1D without complications		€5,433.29	Clarke et al. (2003), cited in Heller et al. (2014)

Step 7. Load auxiliary model parameters

Set simulation duration to lifetime, or some arbitrarily high number of years depending on what your model supports and note in the documentation. Apply a 2.5% discount rate for both costs, QALYs and life-years.

Step 8. Double-check everything

Step 9. Run simulation

The sample sizes for probabilistic models should be large enough for convergence

- Challenge 1
  - Run three separate simulations representing the three distinct scenarios A, B and C described in step 4, using the healthcare payer perspective.
- Challenge 2
  - Run scenario C described in step 4, applying a societal perspective by assuming an income loss of 1% for caregivers for 1 year following a stage 3 diagnosis without monitoring.
  - For microsimulation models, please ensure that the number of replications is sufficient to generate stable results.

Step 10. Extract model results

Extract the results and enter values in a transparent manner in the accompanying Excel Reporting Workbook

Step 11. Document the model and necessary deviations in the Excel Reporting Workbook

4 RESULTS SUBMISSION

4.1 Reported Outcomes

Participants should report the required clinical and economic outcomes using the standardized submission workbook.

4.2 Model Documentation

Participants should submit documentation describing their implementation of the challenge. The documentation should include:

- Model name and version
- Model type
- Description of implementation
- Any material deviations from the challenge specifications
- Justification for those deviations
- Participants are encouraged to describe any implementation challenges or observations that may assist interpretation of differences between models.

4.3 Submission

Participants should submit all required files by the specified submission deadline.

The submission package should include:

- Completed Excel Reporting Workbook
- Any additional materials requested by the organizers