Cross-validation of the IQVIA Core Obesity and Diabetes Model Against the IQVIA Core Diabetes Model

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Introduction

- The IQVIA Core Obesity and Diabetes Model (CODM) is a new, integrated, microsimulation model, using surrogate efficacy inputs like HbA1c, BMI, lipids, blood pressure, eGFR, uACR to estimate long-term clinical and economic outcomes in populations with or without obesity across the glycaemic spectrum[1]. Building on the widely used and validated IQVIA Core Diabetes Model (CDM)[2], the CODM expands modelling to populations living with obesity with and without type 2 diabetes (T2D). This analysis assesses methodological consistency and compares cumulative incidence (CI) and cost-effectiveness (CE) for a hypothetical glycaemic-lowering intervention

Methods

- An equivalent analysis was conducted in CODM v1 and CDM v10, comparing no change in baseline HbA1c with a hypothetical 1.0% reduction in HbA1c in the first year from a baseline of 8.5%. The simulated baseline cohort had mean age 58 years, 55.9% males, 2 years of T2D, no complications, BMI 31.2 kg/m^2 and with disease progression modelled over 20 years. HbA1c, LDL, HDL, and SBP trajectories followed UKPDS90; TCHOL was estimated by the Sampson equation in CODM and Friedewald's formula in CDM; BMI followed UK-CPRD progression (2012) and eGFR followed CRIC (2021) progression in both models; uACR followed CKD-PC (2019) in CODM only (not modelled in the CDM). Cumulative incidences of acute CV events, CHF (1st event), and diabetic foot complications were predicted using UKPDS82 in both models; CHF recurrent were projected using EMPEROR-Preserved[3] in CODM and literature studies[4,5,6] in CDM; eye complications and neuropathy were informed with the same literature sources[7,8,9,10]. Progression to end stage renal disease (ESRD) used UKPDS64 in CDM and CKD-PC equations[11] in CODM. More recent cardiovascular (CV) mortality by age and gender were used in the CODM[12,13,14], whist the same non-disease mortality inputs were used
- The intervention cost was assumed to cost £500 /patient /year more; acute event and chronic complication costs were informed from NICE guideline NG28. Quality of life inputs were literature-based and aligned between the models. Analyses were conducted using first-order individual patient stochastic disease progression and second-order non-parametric bootstraps (NICE DSU TSD 6) with probabilistic sampling of costs / utilities

Results

- A high concordance was observed across trajectories of all physiological parameters between the CDM and CODM, except for uACR—and consequently eGFR—which progressed more rapidly in the CODM by design. At the 20-year time horizon, a strong convergence was achieved (OLS-LRL slope of 1.08 for int. and comp.) for most simulated clinical outcomes (Fig. 1, Table 1), with some, expected deviations. Specifically, renal stage A2 was more prevalent in the CODM, while cumulative incidences of CHF events and all-cause mortality were marginally lower; differences were also observed for foot ulcer and amputation outcomes (Fig. 2)
- Total life-years were approximately 0.5 years higher in the CODM than in the CDM for both intervention and comparator arms, reflecting the application of a half-cycle life-expectancy adjustment in the year of death in the CODM, not applied in the CDM. These differences had minimal impact on total and incremental costs (Fig. 3) and QALEs (Table 2). A larger difference was observed in ICUR, driven by very small incremental QALEs in both models due to the modest, hypothetical HbA1c treatment effect

Conclusions

High concordance in physiological trajectories was observed between the CDM and CODM, as well as strong convergence across most clinical outcomes at 20 years despite design-driven differences. These results support confidence in CODM's suitability to inform policy, reimbursement, and health-economic evaluations in populations living with obesity and T2D

Fig 1. Cumulative incidence of complications/100 patients at 20 years

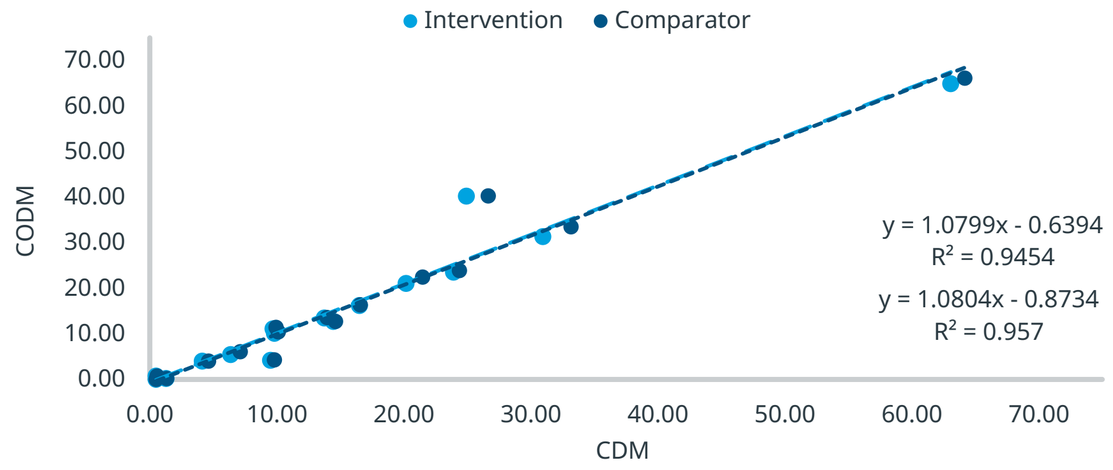

Table 1. Cumulative incidence of complications/100 patients at 20 years

	CDM		CODM	
	Intervention	Comparator	Intervention	Comparator
CHF	14.45	14.63	12.71	12.72
PAD	9.71	9.95	11.09	11.40
Angina	16.51	16.58	16.20	16.36
Stroke	13.75	13.97	13.49	13.59
MI	23.92	24.39	23.55	23.89
Retinopathy	30.96	33.18	31.35	33.50
ME	20.18	21.49	21.08	22.45
SVL	6.37	7.13	5.44	6.08
Cataract	9.81	10.13	10.10	10.42
Ulcer	9.51	9.81	4.17	4.29
Foot 1st Amputation	1.29	1.33	0.18	0.19
Foot 2nd Amputation	0.50	0.52	0.02	0.02
Neuropathy	63.08	64.18	64.92	66.13
A2 (MA)	24.93	26.66	40.25	40.26
A3 (GRP)	4.14	4.63	4.02	4.02
ESRD	0.50	0.58	0.73	0.73

Fig 2. Cumulative incidence of mortality/100 patients at 20 years

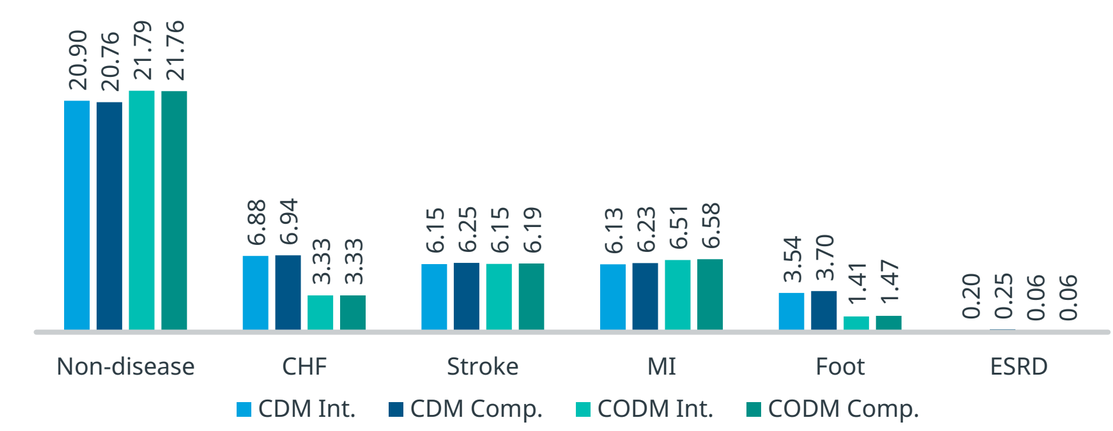

Fig 3. (Discounted) costs at 20 years

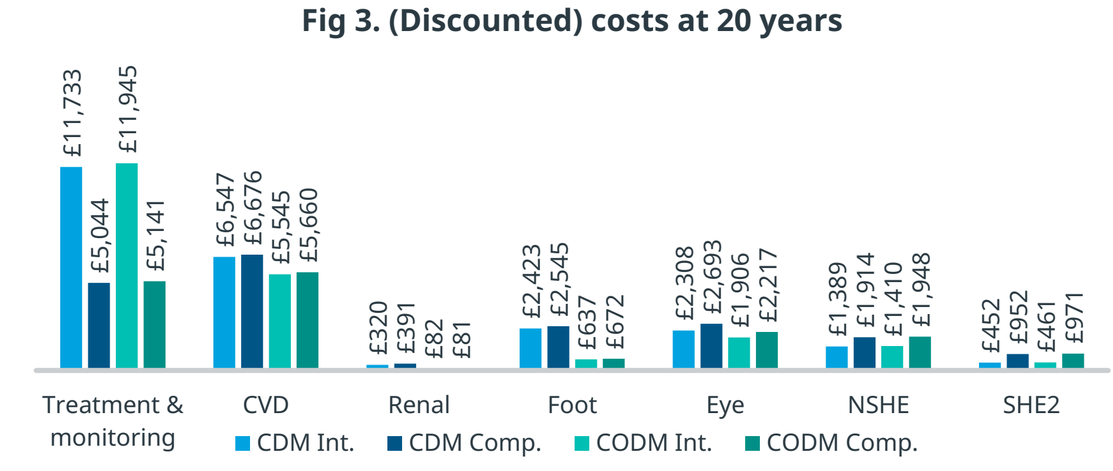

Table 2. (Discounted) Cost-Effectiveness Results

	CDM		CODM	
	Intervention	Comparator	Intervention	Comparator
LE	**12.37** (12.34 to 12.41)	**12.34** (12.30 to 12.38)	**12.77** (12.56 to 12.97)	**12.75** (12.55 to 12.97)
QALE	**8.56** (8.54 to 8.59)	**8.47** (8.44 to 8.49)	**8.67** (8.52 to 8.81)	**8.58** (8.43 to 8.72)
Costs (£)	**25,171** (24,820 to 25,521)	**20,215** (19,849 to 20,581)	**21,985** (21,098 to 22,940)	**16,689** (15,817 to 17,626)
ICUR (£/QALE)	**51,676**		**60,630**	

Abbreviations. BMI: Body-Mass Index; **CDM**: Core Diabetes Model; **CE**: Cost-Effectiveness; **CHF**: Congestive Heart Failure; **CODM**: Core Obesity and Diabetes Model; **Comp**: Comparator; **CVD**: Cardio-Vascular Disease; **eGFR**: Estimated Glomerular Filtration Rate; **ESRD**: End-Stage Renal Disease; **GRP**: Gross proteinuria; **HbA1c**: Hemoglobin A1c; **HDL**: High-density Lipoprotein; **ICUR**: Incremental Cost-Utility Ratio; **Int**: Intervention; **LDL**: Low-density Lipoprotein; **LE**: Life Expectancy; **MA**: Microalbuminuria; **ME**: Macular Edema; **MI**: Myocardial Infarction; **NSHE**: Non-severe Hypoglycaemic Event; **PAD**: Peripheral Artery Disease; **QALE**: Quality-Adjusted Life Expectancy; **SBP**: Systolic Blood Pressure; **SHE2**: Severe Hypoglycaemic Event Type 2; **SVL**: Severe Vision Loss; **TCHOL**: Total Cholesterol; **T2D**: Type 2 Diabetes; **uACR**: Urine Albumin to Creatinine Ratio;

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