Type 2 Diabetes (T2D)

There are two case algorithms provided for T2D. The first (**t2d_dprism_ehr_plus_1**) is the preferred case algorithm and includes self-reported T2D information collected from survey. The second (**t2d_dprism_ehr_1**) is an alternative case algorithm that does NOT include self-reported T2D information collected from survey.

We request harmonization based on the **preferred algorithm**, but if self-reported T2D survey information is not available, the alternative algorithm is acceptable.

For studies where T2D status is based solely on self-reported survey data, incorporating additional information from the preferred and alternative algorithms is recommended.

Please report which algorithm was used. If using either of these algorithms is not possible in the biobank, we want to be inclusive of other definitions of T2D.

Codes

Concept	**Vocabulary**	**Code**
Type 1 diabetes	ICD-9	250.(0-9)1* 250.(0-9)3
	ICD-10	E10
	SNOMED	46635009
Type 2 diabetes	ICD-9	250.(0-9)0, 250.(0-9)2 Exclude: 250.10, 250.12
	ICD-10	E11
	SNOMED	44054006
Drug-induced diabetes	ICD-9	249
	ICD-10	E09

	SNOMED	5368009
Gestational diabetes mellitus	ICD-9	648.0
	ICD-10	O24.4
	SNOMED	11687002
Prediabetes	ICD-9	790.29
	ICD-10	R73.03
	SNOMED	714628002
Glycosuria	ICD-9	791.5
	ICD-10	R81
	SNOMED	45154002
Non-Insulin blood glucose lowering medications	ATC	A10B
	OMOP ID	21600744
Insulin and analogues medications	ATC	A10A
	OMOP ID	21600713
	ICD-10	Z79.4
Hba1c Note: Do not use the Hba1c harmonized levels for the Legacy Project, as they represent the individual's earliest measurement.	SNOMED	43396009 ID:4184637
	LOINC	1621295 - 3004410 (code:4548-4)

		- 3003309 (code:4549-2) - 3005673 (code:17856-6)
Fasting glucose	SNOMED	167096006
	LOINC	1558-6
Random glucose	SNOMED	167095005
	LOINC	2339-0,2345-7,74774-1 3021737 (code:1521-4) 3020193 (code:16169-5)

Preferred Case Algorithm:

- **t2d_dprism_ehr_plus_1:** corresponds to the **T2D case [EHR+ algorithm]** in the provided figure, which includes self-reported T2D information from survey

Alternative Case Algorithm:

- **t2d_dprism_ehr_1:** corresponds to the **T2D case [EHR algorithm]** in the provided figure, which does NOT include self-reported T2D information from survey

Control Algorithm:

- The **universal control algorithm** in the provided figure should be used, regardless of which case algorithm is used.

Covariate data to collect:

- Age at latest assessment/exam
    - Filter to age >= 25 years

- Sex
- BMI
    - Collect both median and latest assessment/exam

Unit conversions:

- Hba1c

≥6.5% (≥48 mmol/mol)

- Glucose

≥126 mg/dL (≥7.0 mmol/L)

≥200 mg/dL (≥11.1 mmol/L)

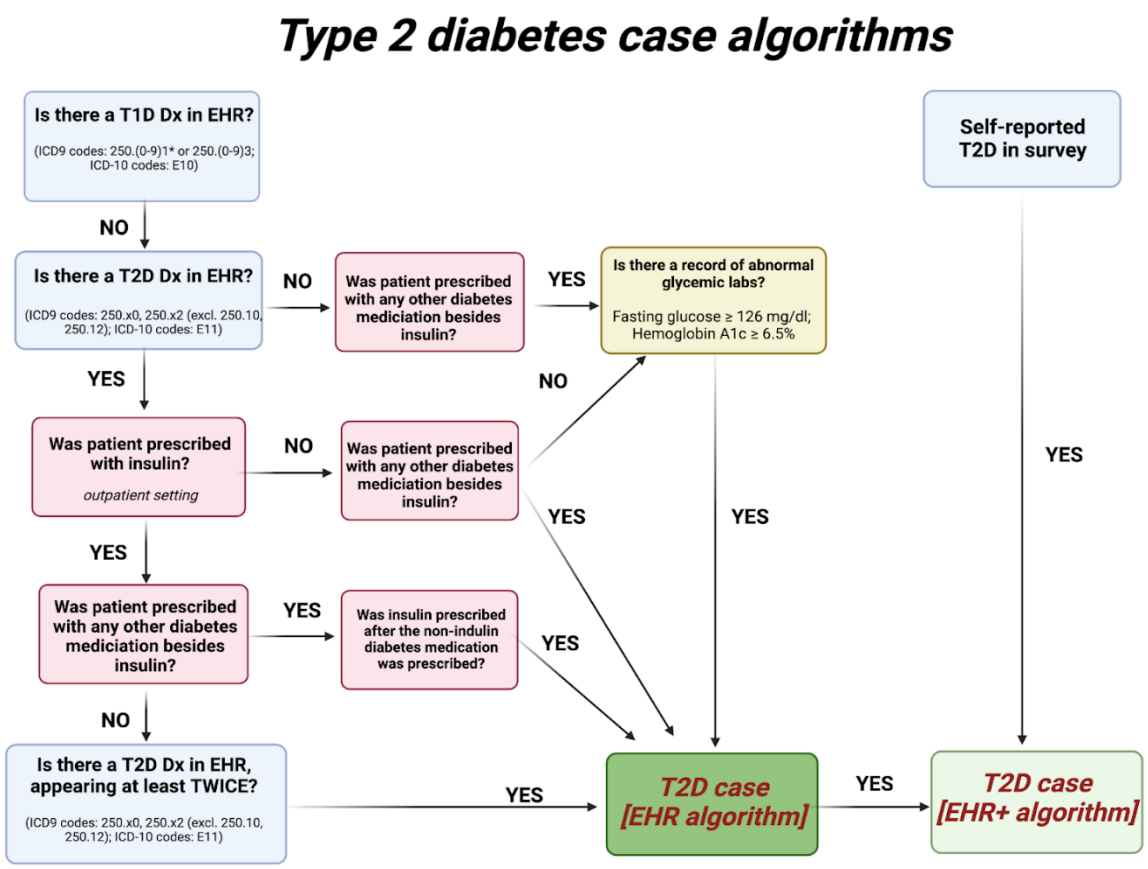
Exclusion criteria:

- Individuals with age < 25 years at latest assessment/exam in cases and control groups.
- Individual exclusion criteria in case group
    - Individuals with the Type 1 diabetes mellitus diagnosis **at any timepoint** should be excluded from cases.
- Individual exclusion criteria in control group
    - Individuals with any type of diabetes mellitus diagnosis or related conditions **at any timepoint** should be excluded from controls.

Case definition:

For T2D cases (algorithm developed for *All of Us*), we modified the Northwestern University T2D algorithm. In the first step, we filter out subjects with ICD-based diagnosis of T1D. After this exclusion step, there are multiple possible decision paths to code a participant as having T2D. First we require cases with T2D diagnosis based on ICD codes to have a prescription of diabetes medications. If a patient has an outpatient* insulin treatment record, either the prescription of at least one additional non-insulin diabetes medication before initiation of insulin therapy or at least two different independent ICD diagnoses of T2D are required for the individual to be classified as a T2D case. For subjects with T2D ICD-based diagnosis but without any diabetes medication records, we require the presence of at least one abnormal glycemic laboratory result (fasting glucose ≥ 126 mg/dl or HbA1c ≥ 6.5%) before calling them a case. Finally, for subjects without T2D diagnosis records to be classified as a case, we require a prescription for any non-insulin diabetes medication and abnormal laboratory results for fasting glucose or HbA1c. T2D EHR+ case definition also includes individuals designated as a case by the EHR algorithm described above or who responded as having T2D in their participant survey.

**If records are not tracked as inpatient or outpatient, then consider all available records.*



Control definition:

We defined a universal algorithm (developed for use in *All of Us*) for the identification of control subjects without diabetes, based on the Northwestern University T2D control algorithm, that can be used in both T1D and T2D studies. Participants were included as controls if they had 1) at least one in-person healthcare provider visit, 2) at least one glucose measurement available in EHR, 3) no abnormal random glucose, fasting glucose, or HbA1c lab values if they are available, 4) no diagnoses of any type of diabetes (including T1D, T2D, drug-induced diabetes, GDM) or related conditions (prediabetes, glycosuria), based on EHR data or survey responses, and 5) no prescriptions of diabetes medications.

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diabetes controls algorithm