**HbA1C Algorithm**

**Overall procedure (hba1c specific in parenthesis)**

1. Extract trait measurements using measurement codes and calculations
2. Convert measurement units to expected units, if necessary (% is unit)
3. Compute a single value per individual for inclusion in analysis (earliest measurement)
4. Apply individual exclusion criteria
5. Apply measurement exclusion criteria, other than statistical outliers
6. Remove statistical outliers
7. Calculate counts of flagged individuals

**Measurement codes and calculations**

The [primed\_consortia\_legacy\_project\_phenotypes GitHub repository](https://manning-lab.github.io/primed_consortia_legacy_project_phenotypes/) provides files containing codes for the following vocabularies. Files can be downloaded and used to identify measurements.

**HbA1c**

View attached Hba1c\_codes.csv

### **Medications**

Use available mapping to find all drugs/medication in the hierarchical [Anatomical Therapeutic Chemical (ATC) Classification](https://www.who.int/tools/atc-ddd-toolkit/atc-classification).

#### **Diabetes Medications**

ATC 2nd level [A10: DRUGS USED IN DIABETES](https://athena.ohdsi.org/search-terms/terms/21600712)

Additional file also with these codes is attached to the algorithm page (Drugs Used in Diabetes.csv)

**Expected units**

Please convert values measured in other units of measurement to the following units:

* HbA1c: %

**Conversions for HbA1c**

|  |
| --- |
| **Table 1a.** Converting values from mmol/mol  to % |
|  |  |
| HbA1c\_% = (HbA1c\_mmolL/10.929) + 2.15 |
|  |  |

**Compute a single value per individual for inclusion in analysis**

Filter to the first HbA1c measurement taken for each individual, prior to applying exclusion criteria.

* Use the HbA1c value at the earliest time point in EHR
* Use the age associated with the selected HbA1c value

**Exclusion criteria**

**Individual exclusion criteria**

Individuals with the following condition or diagnosis **at any timepoint** should be excluded from analysis. Codes for these conditions can be found in an additional file entitled Hba1c\_exclusions.

* End stage kidney disease
* Splenectomy or spleen disorders
* T1D and other types of diabetes Dx (except T2D) records

**Measurement exclusion criteria**

The following measurements should be excluded from the analysis. Note that for this phenotype, measurement exclusions are also effectively individual exclusions, since a single measurement per individual has already been selected.

* Age at measurement <18 years
* Exclude measurements taken within 1 month (window: -1 month to +1 month) of an Inpatient or Emergency Department visit.
* Exclude individuals who have T2D Dx or anti-diabetic drug records prior to the measurement (found in the Hba1c\_exclusions and Drugs Used in Diabetes.csv files).
* Exclude individuals who have blood transfusion within 3 months before (window: -3 months to time of measurement) the measurement (blood transfusion; also included in the Hba1c\_exclusions file).

**Remove statistical outliers**

* Remove measurements that are outside +/- 6 SD from the overall mean HbA1c count in the total population, after applying all other exclusions

**Flagged individuals**

Flagged individuals can still be included in analysis, but the number of participants with these conditions should be reported. (Codes can be found in the Hba1c\_exclusions file attached to this algorithm page)

* T2D diagnosis after the selected measurement
* Anti-diabetes drug record after the selected measurement