**White blood cell count**

This document describes steps for one trait and one analysis:

* **White blood cell count (WBC)**

**Overall procedure**

1. Extract trait measurements using measurement codes and calculations
2. Convert measurement units to expected units, if necessary
3. Apply individual exclusion criteria
4. Apply measurement exclusion criteria, other than statistical outliers
5. Remove statistical outliers
6. Compute a single value per individual for inclusion in analysis
7. Calculate counts of flagged individuals
8. 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.

**WBC**

* SNOMED:
  + white\_blood\_cell\_count\_SNOMED\_4298431\_AKM\_17Oct2024\_UNIQUE\_CODES.csv
  + [WBC count in Athena](https://athena.ohdsi.org/search-terms/terms/4298431)
* LOINC
  + leukocytes\_in\_blood\_LOINC\_37043992\_AKM\_17Oct2024\_UNIQUE\_CODES.csv
  + [Leukocytes in blood in Athena](https://athena.ohdsi.org/search-terms/terms/37043992)

**Medications**

Not applicable for this trait.

**Expected units**

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

* WBC: 10^9/L
* See [WBC Count Units of Measure for unit equivalences](https://docs.google.com/spreadsheets/d/1DHGBj34wFI7_5Qm14Hb9fXkx0z1uMwuHICyaBHTxxMk/edit?usp=sharing)

**Exclusion criteria**

**Individual exclusion criteria**

Individuals with the following condition or diagnosis **at any timepoint** should be excluded from analysis.

These codes will be available from an attached excel document.

* Blood diseases
* Congenital blood disorders (anemia, polycythemia, neutropenia, thrombocytopenia)
* Diseases of white blood cells
* Diseases of blood and blood-forming organs
* Aplastic anemia, Hemoglobinopathy
* Bone marrow transplant
* Blood cancers
* HIV diagnosis
* Dialysis and End stage kidney disease
* Splenectomy/spleen disorders
* Cirrhosis of liver
* Blood transfusions
* Chemotherapies

**Measurement exclusion criteria**

The following measurements should be excluded from the analysis. Other measurements from an individual may still be included in analysis.

* Age at measurement <18 years
* Exclude measurements taken at Inpatient or Emergency Department visits. Alternatively, keep only measurements taken at Outpatient visits. Take whichever approach is most appropriate for your EHR.
* Exclude measurements occurring within 90 days of any [sepsis diagnosis codes](https://docs.google.com/document/d/10W2jN5oHvuWXFANV4zi8RcChNYmE7ZzIsb47PPBex3k/edit?tab=t.65b2fqbcqh8a#heading=h.6siu9iy8dljv) (up to 90 days before or 90 days after)
* Exclude measurements with value 0

**Remove statistical outliers**

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

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

After all exclusions are applied, the remaining measurements can be used to compute the final value for each individual for analysis.

* Calculate median WBC count for each individual
* Calculate median age for each individual from the same timepoints used to calculate median WBC
* Note that there is no requirement for minimum number of visits or WBC measurements.

**Flagged individuals**

Not applicable for this analysis.