**Modelling biomarker information**

**Challenges:**

* The importance of the context: a biomarker can be measured with different assays and have more than one use, depending on an association with a specific disease, as described in the provided evidence.
* Sets, panels or combinatorial markers: can contain multiple markers, either within the same assay or a combination of different assays. In other words, there is no 1-1 relationship between all biomarker attributes (described in minimal information document)
* on a theoretical level – do we want to have a defined entity for a biomarker ? Or is it enough/more accurate to only represent/talk about an association ?

**Suggestions:**

**1 )**

* Class: Biomarker
  + Disease
  + Type: single / panel
  + Usage
  + BiomarkerMeasurement (s) \*
  + Evidence
  + Status: approved / candidate
* Class: BiomarkerMeasurement
  + BiomarkerComponent (s) \*\*
  + Location
  + Assay
    - Sub Class: MolecularBiomarkerMeasurement
      * Type: genetic/proteomic/metabolic/.. (\*\*\*)
      * Specimen
    - Sub Class: PhysiologicBiomarkerMeasurement
    - Sub Class: RadiographicBiomarkerMeasurment
    - Sub Class: HistologicBiomarkerMeasurement
      * Specimen

(\*) a biomarker panel can have one measurement of a set within the same assay or many measurements of different types (for ex a physiologic and a molecular), each with one or more components

(\*\*) a biomarkerMeasurement can have multiple biomarker components (a set/panel) within a single assay. Ideally, each biomarkerComponenet can be linked to an existing entity (a gene, protein, molecule) – but then what do we do when there is no entity (mainly for non-molecular biomarkers)? a literal?

(\*\*\*) Still needs to be clarified, maybe on a lower level (gene expression, protein, peptide, gene mutation, SNP, miRNA, lipid, DNA methylation,…)

**2)**

* Class: BiomarkerDiseaseAssiciation
  + Disease
  + Usage
  + BiomarkerMeasurement (s) \*
  + Evidence
  + Status (?)
* Class: BiomarkerMeasurement
  + Biomarker (s) \*\*
  + Type (molecular,physiologic,..)
  + Source/location (term still has to be decided or split into different attributes)
  + Assay

(\*) a biomarkerDiseaseAssociation can have multiple measurements (panel/combinatorial marker) of different assays, each (assay) may be associated with one or more biomarkers

**Remarks:**

* Status of biomarker-disease association is indicated in order to distinguish between validated/approved and candidate/potential markers.
* An expanded version could include the value(s) of a measurement associated with a disease/condition
* Predictive, risk and response biomarkers (usage) should also be associated with a treatment (represent as a subclass with an additional attribute?)