

Lab notebook

KBC

4/5/2021

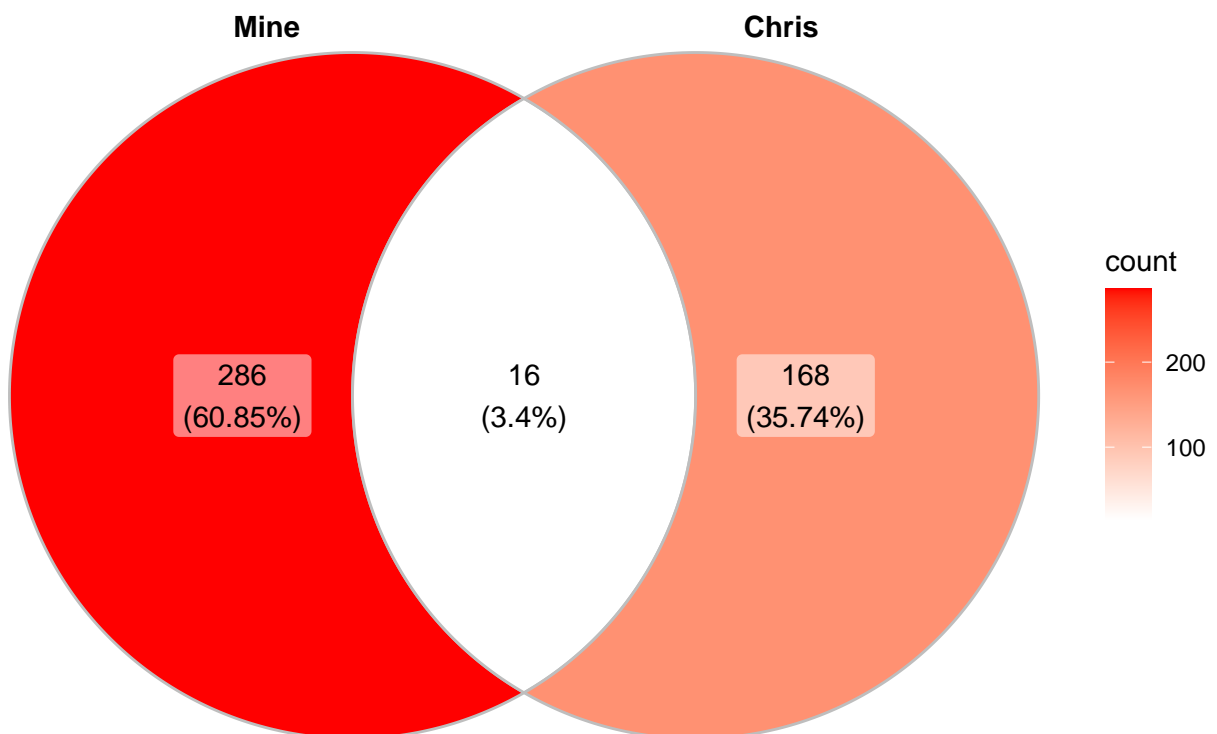
2021-04-05 report

Utility functions

Opposites already manually paired

Bill can explain where these came from better than I can.

Comparison to Chris et al.'s stuff



```
## [1] "Mine:"
```

```
## # A tibble: 302 x 2
##   term01      term02
##   <chr>      <chr>
## 1 HP:0030469 HP:0008275
## 2 HP:0100737 HP:0100736
## 3 HP:0025090 HP:0025129
## 4 HP:0031199 HP:0031197
## 5 HP:0011790 HP:0011791
## 6 HP:0012388 HP:0004469
## 7 HP:0100282 HP:0100281
## 8 HP:0012451 HP:0012450
## 9 HP:0032675 HP:0032676
## 10 HP:0011880 HP:0005520
## # ... with 292 more rows
```

```
## [1] "Chris's:"
```

```
## # A tibble: 184 x 2
##   term01      term02
##   <chr>      <chr>
## 1 HP:0000098 HP:0004322
## 2 HP:0000103 HP:0011037
## 3 HP:0000154 HP:0000160
## 4 HP:0000158 HP:0000171
## 5 HP:0000188 HP:0011341
## 6 HP:0000239 HP:0005486
## 7 HP:0000253 HP:0004481
## 8 HP:0000274 HP:0100729
## 9 HP:0000275 HP:0000283
## 10 HP:0000276 HP:0011219
## # ... with 174 more rows
```

OK, we know the intersection/complements, so let's see what Chris's opposites look like, exactly.

```
## Warning: package 'ontologyIndex' was built under R version 4.0.2
```

```
## [1] "FOUND BY BOTH ME AND CHRIS:"
```

```
## [1] "Decreased activity of mitochondrial respiratory chain      Increased activity of mitochondrial r
## [1] "Decreased circulating ACTH level      Increased circulating ACTH level"
## [1] "Decreased circulating antibody level      Increased circulating antibody level"
## [1] "Decreased HDL cholesterol concentration      Increased HDL cholesterol concentration"
## [1] "Decreased inflammatory response      Increased inflammatory response"
## [1] "Decreased lymphocyte apoptosis      Increased lymphocyte apoptosis"
## [1] "Decreased mean platelet volume      Increased mean platelet volume"
## [1] "Decreased mitochondrial number      Increased mitochondrial number"
## [1] "Decreased pineal volume      Increased pineal volume"
## [1] "Decreased size of nasopharyngeal adenoids      Increased size of nasopharyngeal adenoids"
## [1] "Decreased urinary sulfate      Increased urinary sulfate"
## [1] "Decreased urinary urate      Increased urinary urate"
## [1] "Large basal ganglia      Small basal ganglia"
## [1] "Large humeral epiphyses      Small humeral epiphyses"
## [1] "Large radial epiphyses      Small radial epiphyses"
## [1] "Large sella turcica      Small sella turcica"
```

```

## [1] "FOUND BY ME, NOT BY CHRIS:"

## [1] ""

## [1] "Abnormal dark-adapted electroretinogram      Abnormal light-adapted electroretinogram"
## [1] "Abnormal hard palate morphology      Abnormal soft palate morphology"
## [1] "Abnormal large intestinal mucosa morphology      Abnormal small intestinal mucosa morphology"
## [1] "Acellular urinary casts      Cellular urinary casts"
## [1] "Activating thyroid-stimulating hormone receptor defect      Inactivating thyroid-stimulating hormone receptor defect"
## [1] "Acute bronchitis      Chronic bronchitis"
## [1] "Acute colitis      Chronic colitis"
## [1] "Acute constipation      Chronic constipation"
## [1] "Acute cutaneous wound      Chronic cutaneous wound"
## [1] "Acute disseminated intravascular coagulation      Chronic disseminated intravascular coagulation"
## [1] "Acute hepatic failure      Chronic hepatic failure"
## [1] "Acute hepatitis      Chronic hepatitis"
## [1] "Acute leukemia      Chronic leukemia"
## [1] "Acute myelomonocytic leukemia      Chronic myelomonocytic leukemia"
## [1] "Acute otitis media      Chronic otitis media"
## [1] "Acute pancreatitis      Chronic pancreatitis"
## [1] "Acute respiratory acidosis      Chronic respiratory acidosis"
## [1] "Acute sinusitis      Chronic sinusitis"
## [1] "Acute tubulointerstitial nephritis      Chronic tubulointerstitial nephritis"
## [1] "Acute      Chronic"
## [1] "Adenocarcinoma of the large intestine      Adenocarcinoma of the small intestine"
## [1] "Affected      Unaffected"
## [1] "Agranulocytosis      Granulocytosis"
## [1] "Alobar holoprosencephaly      Lobar holoprosencephaly"
## [1] "Anhidrotic ectodermal dysplasia      Hidrotic ectodermal dysplasia"
## [1] "Asymmetric peripheral demyelination      Symmetric peripheral demyelination"
## [1] "Atonic seizure      Tonic seizure"
## [1] "Atypical absence seizure      Typical absence seizure"
## [1] "Atypical absence status epilepticus      Typical absence status epilepticus"
## [1] "Cleft hard palate      Cleft soft palate"
## [1] "Closed comedo      Open comedo"
## [1] "Communicating hydrocephalus      Noncommunicating hydrocephalus"
## [1] "Complete atrioventricular canal defect      Partial atrioventricular canal defect"
## [1] "Complete breech presentation      Incomplete breech presentation"
## [1] "Complete congenital stationary night blindness      Incomplete congenital stationary night blindness"
## [1] "Complete diaphragmatic absence of pericardium      Partial diaphragmatic absence of pericardium"
## [1] "Complete duplication of the 1st metatarsal      Partial duplication of the 1st metatarsal"
## [1] "Complete duplication of the distal phalanges of the hand      Partial duplication of the distal phalanges of the hand"
## [1] "Complete duplication of the distal phalanx of the 2nd finger      Partial duplication of the distal phalanx of the 2nd finger"
## [1] "Complete duplication of the distal phalanx of the 2nd toe      Partial duplication of the distal phalanx of the 2nd toe"
## [1] "Complete duplication of the distal phalanx of the 3rd finger      Partial duplication of the distal phalanx of the 3rd finger"
## [1] "Complete duplication of the distal phalanx of the 3rd toe      Partial duplication of the distal phalanx of the 3rd toe"
## [1] "Complete duplication of the distal phalanx of the 4th finger      Partial duplication of the distal phalanx of the 4th finger"
## [1] "Complete duplication of the distal phalanx of the 4th toe      Partial duplication of the distal phalanx of the 4th toe"
## [1] "Complete duplication of the distal phalanx of the 5th finger      Partial duplication of the distal phalanx of the 5th finger"
## [1] "Complete duplication of the distal phalanx of the 5th toe      Partial duplication of the distal phalanx of the 5th toe"
## [1] "Complete duplication of the distal phalanx of the hallux      Partial duplication of the distal phalanx of the hallux"
## [1] "Complete duplication of the middle phalanges of the hand      Partial duplication of the middle phalanges of the hand"
## [1] "Complete duplication of the middle phalanx of the 2nd finger      Partial duplication of the middle phalanx of the 2nd finger"
## [1] "Complete duplication of the middle phalanx of the 2nd toe      Partial duplication of the middle phalanx of the 2nd toe"

```

[1] "Complete duplication of the middle phalanx of the 3rd finger Partial duplication of the mid
 ## [1] "Complete duplication of the middle phalanx of the 3rd toe Partial duplication of the middle
 ## [1] "Complete duplication of the middle phalanx of the 4th finger Partial duplication of the mid
 ## [1] "Complete duplication of the middle phalanx of the 4th toe Partial duplication of the middle
 ## [1] "Complete duplication of the middle phalanx of the 5th finger Partial duplication of the mid
 ## [1] "Complete duplication of the middle phalanx of the 5th toe Partial duplication of the middle
 ## [1] "Complete duplication of the phalanges of the 2nd finger Partial duplication of the phalange
 ## [1] "Complete duplication of the phalanges of the 3rd finger Partial duplication of the phalange
 ## [1] "Complete duplication of the phalanges of the 4th finger Partial duplication of the phalange
 ## [1] "Complete duplication of the phalanges of the 5th finger Partial duplication of the phalange
 ## [1] "Complete duplication of the proximal phalanges of the hand Partial duplication of the proxim
 ## [1] "Complete duplication of the proximal phalanx of the 2nd finger Partial duplication of the p
 ## [1] "Complete duplication of the proximal phalanx of the 2nd toe Partial duplication of the prox
 ## [1] "Complete duplication of the proximal phalanx of the 3rd finger Partial duplication of the p
 ## [1] "Complete duplication of the proximal phalanx of the 3rd toe Partial duplication of the prox
 ## [1] "Complete duplication of the proximal phalanx of the 4th finger Partial duplication of the p
 ## [1] "Complete duplication of the proximal phalanx of the 4th toe Partial duplication of the prox
 ## [1] "Complete duplication of the proximal phalanx of the 5th finger Partial duplication of the p
 ## [1] "Complete duplication of the proximal phalanx of the 5th toe Partial duplication of the prox
 ## [1] "Complete duplication of the proximal phalanx of the hallux Partial duplication of the proxim
 ## [1] "Complete duplication of thumb phalanx Partial duplication of thumb phalanx"
 ## [1] "Complete left sided absence of pericardium Partial left sided absence of pericardium"
 ## [1] "Complete right sided absence of pericardium Partial right sided absence of pericardium"
 ## [1] "Complex febrile seizure Simple febrile seizure"
 ## [1] "Complex renal cyst Simple renal cyst"
 ## [1] "Conjugated hyperbilirubinemia Unconjugated hyperbilirubinemia"
 ## [1] "Cyclophoria Incyclophoria"
 ## [1] "Cyclotropia Incyclotropia"
 ## [1] "Decreased adiponectin level Increased adiponectin level"
 ## [1] "Decreased adipose tissue Increased adipose tissue"
 ## [1] "Decreased antimullerian hormone level Increased antimullerian hormone level"
 ## [1] "Decreased Arden ratio of electrooculogram Increased Arden ratio of electrooculogram"
 ## [1] "Decreased basophil count Increased basophil count"
 ## [1] "Decreased biotinidase level Increased biotinidase level"
 ## [1] "Decreased blood drug concentration Increased blood drug concentration"
 ## [1] "Decreased body fat percentage Increased body fat percentage"
 ## [1] "Decreased body mass index Increased body mass index"
 ## [1] "Decreased body weight Increased body weight"
 ## [1] "Decreased circulating 18-hydroxycortisone level Increased circulating 18-hydroxycortisone l
 ## [1] "Decreased circulating A-type natriuretic peptide level Increased circulating A-type natriur
 ## [1] "Decreased circulating androgen level Increased circulating androgen level"
 ## [1] "Decreased circulating beta-2-microglobulin level Increased circulating beta-2-microglobulin
 ## [1] "Decreased circulating beta-C-terminal telopeptide level Increased circulating beta-C-termin
 ## [1] "Decreased circulating ceruloplasmin concentration Increased circulating ceruloplasmin conce
 ## [1] "Decreased circulating chylomicron concentration Increased circulating chylomicron concentra
 ## [1] "Decreased circulating copper concentration Increased circulating copper concentration"
 ## [1] "Decreased circulating corticosterone level Increased circulating corticosterone level"
 ## [1] "Decreased circulating cortisol level Increased circulating cortisol level"
 ## [1] "Decreased circulating free fatty acid level Increased circulating free fatty acid level"
 ## [1] "Decreased circulating free T3 Increased circulating free T3"
 ## [1] "Decreased circulating free T4 level Increased circulating free T4 level"
 ## [1] "Decreased circulating globulin level Increased circulating globulin level"
 ## [1] "Decreased circulating gonadotropin level Increased circulating gonadotropin level"
 ## [1] "Decreased circulating heparan sulfate level Increased circulating heparan sulfate level"

[1] "Decreased circulating IgA level Increased circulating IgA level"
 ## [1] "Decreased circulating IgG level Increased circulating IgG level"
 ## [1] "Decreased circulating IgG1 level Increased circulating IgG1 level"
 ## [1] "Decreased circulating IgG2 level Increased circulating IgG2 level"
 ## [1] "Decreased circulating IgG3 level Increased circulating IgG3 level"
 ## [1] "Decreased circulating IgG4 level Increased circulating IgG4 level"
 ## [1] "Decreased circulating osteocalcin level Increased circulating osteocalcin level"
 ## [1] "Decreased circulating progesterone Increased circulating progesterone"
 ## [1] "Decreased circulating purine concentration Increased circulating purine concentration"
 ## [1] "Decreased circulating renin level Increased circulating renin level"
 ## [1] "Decreased circulating selenium concentration Increased circulating selenium concentration"
 ## [1] "Decreased circulating T4 level Increased circulating T4 level"
 ## [1] "Decreased complex N-glycan level Increased complex N-glycan level"
 ## [1] "Decreased core 1 O-glycan level Increased core 1 O-glycan level"
 ## [1] "Decreased corneal thickness Increased corneal thickness"
 ## [1] "Decreased CSF alanine concentration Increased CSF alanine concentration"
 ## [1] "Decreased CSF albumin concentration Increased CSF albumin concentration"
 ## [1] "Decreased CSF arginine concentration Increased CSF arginine concentration"
 ## [1] "Decreased CSF glutamate concentration Increased CSF glutamate concentration"
 ## [1] "Decreased CSF glutamine concentration Increased CSF glutamine concentration"
 ## [1] "Decreased CSF histidine concentration Increased CSF histidine concentration"
 ## [1] "Decreased CSF isoleucine concentration Increased CSF isoleucine concentration"
 ## [1] "Decreased CSF leucine concentration Increased CSF leucine concentration"
 ## [1] "Decreased CSF lysine concentration Increased CSF lysine concentration"
 ## [1] "Decreased CSF phenylalanine concentration Increased CSF phenylalanine concentration"
 ## [1] "Decreased CSF protein Increased CSF protein"
 ## [1] "Decreased CSF serine concentration Increased CSF serine concentration"
 ## [1] "Decreased CSF threonine concentration Increased CSF threonine concentration"
 ## [1] "Decreased CSF tyrosine concentration Increased CSF tyrosine concentration"
 ## [1] "Decreased CSF valine concentration Increased CSF valine concentration"
 ## [1] "Decreased CSF/serum albumin ratio Increased CSF/serum albumin ratio"
 ## [1] "Decreased cystatin C level Increased cystatin C level"
 ## [1] "Decreased DLCO Increased DLCO"
 ## [1] "Decreased female libido Increased female libido"
 ## [1] "Decreased femoral torsion Increased femoral torsion"
 ## [1] "Decreased fetal movement Increased fetal movement"
 ## [1] "Decreased fibular diameter Increased fibular diameter"
 ## [1] "Decreased fucosylation of N-linked protein glycosylation Increased fucosylation of N-linked
 ## [1] "Decreased fucosylation of O-linked protein glycosylation Increased fucosylation of O-linked
 ## [1] "Decreased glomerular filtration rate Increased glomerular filtration rate"
 ## [1] "Decreased glucagon level Increased glucagon level"
 ## [1] "Decreased glucose-6-phosphate dehydrogenase level in blood Increased glucose-6-phosphate del
 ## [1] "Decreased glucose-6-phosphate dehydrogenase level in dried blood spot Increased glucose-6-ph
 ## [1] "Decreased glucose-6-phosphate dehydrogenase level in leukocytes Increased glucose-6-phospha
 ## [1] "Decreased glucose-6-phosphate dehydrogenase level in red blood cells Increased glucose-6-ph
 ## [1] "Decreased glucose-6-phosphate dehydrogenase level in tissue Increased glucose-6-phosphate d
 ## [1] "Decreased HDL2a concentration Increased HDL2a concentration"
 ## [1] "Decreased HDL2b concentration Increased HDL2b concentration"
 ## [1] "Decreased HDL3a concentration Increased HDL3a concentration"
 ## [1] "Decreased HDL3b concentration Increased HDL3b concentration"
 ## [1] "Decreased HDL3c concentration Increased HDL3c concentration"
 ## [1] "Decreased head circumference Increased head circumference"
 ## [1] "Decreased heart rate variability Increased heart rate variability"
 ## [1] "Decreased helper T cell proportion Increased helper T cell proportion"

[1] "Decreased hemoglobin concentration Increased hemoglobin concentration"
 ## [1] "Decreased hepatic echogenicity Increased hepatic echogenicity"
 ## [1] "Decreased high-mannose N-glycan level Increased high-mannose N-glycan level"
 ## [1] "Decreased immunoglobulin level in body fluid Increased immunoglobulin level in body fluid"
 ## [1] "Decreased incisura length Increased incisura length"
 ## [1] "Decreased intestinal transit time Increased intestinal transit time"
 ## [1] "Decreased intracranial pressure Increased intracranial pressure"
 ## [1] "Decreased LDL cholesterol concentration Increased LDL cholesterol concentration"
 ## [1] "Decreased level of carnosine in blood Increased level of carnosine in blood"
 ## [1] "Decreased level of GABA in serum Increased level of GABA in serum"
 ## [1] "Decreased level of platelet-activating factor Increased level of platelet-activating factor"
 ## [1] "Decreased libido Increased libido"
 ## [1] "Decreased male libido Increased male libido"
 ## [1] "Decreased mannose-binding protein level Increased mannose-binding protein level"
 ## [1] "Decreased mannosylation of N-linked protein glycosylation Increased mannosylation of N-linked protein glycosylation"
 ## [1] "Decreased mean corpuscular hemoglobin concentration Increased mean corpuscular hemoglobin concentration"
 ## [1] "Decreased mean corpuscular volume Increased mean corpuscular volume"
 ## [1] "Decreased monosialylated core 1 O-glycan level Increased monosialylated core 1 O-glycan level"
 ## [1] "Decreased muscle glycogen content Increased muscle glycogen content"
 ## [1] "Decreased phosphoribosylpyrophosphate synthetase level Increased phosphoribosylpyrophosphate synthetase level"
 ## [1] "Decreased pituitary glycoprotein hormone alpha subunit level Increased pituitary glycoprotein hormone alpha subunit level"
 ## [1] "Decreased proportion of CD4+CD25+ regulatory T cells Increased proportion of CD4+CD25+ regulatory T cells"
 ## [1] "Decreased proportion of CD4-positive T cells Increased proportion of CD4-positive T cells"
 ## [1] "Decreased proportion of CD4-positive, alpha-beta memory T cells Increased proportion of CD4-positive, alpha-beta memory T cells"
 ## [1] "Decreased proportion of CD8-positive, alpha-beta memory T cells Increased proportion of CD8-positive, alpha-beta memory T cells"
 ## [1] "Decreased proportion of CD8-positive, alpha-beta TEMRA T cells Increased proportion of CD8-positive, alpha-beta TEMRA T cells"
 ## [1] "Decreased proportion of central memory CD4-positive, alpha-beta T cells Increased proportion of central memory CD4-positive, alpha-beta T cells"
 ## [1] "Decreased proportion of central memory CD8-positive, alpha-beta T cells Increased proportion of central memory CD8-positive, alpha-beta T cells"
 ## [1] "Decreased proportion of class-switched memory B cells Increased proportion of class-switched memory B cells"
 ## [1] "Decreased proportion of effector memory CD8-positive, alpha-beta T cells Increased proportion of effector memory CD8-positive, alpha-beta T cells"
 ## [1] "Decreased proportion of gamma-delta T cells Increased proportion of gamma-delta T cells"
 ## [1] "Decreased proportion of immature B cells Increased proportion of immature B cells"
 ## [1] "Decreased proportion of immature gamma-delta T cells Increased proportion of immature gamma-delta T cells"
 ## [1] "Decreased proportion of marginal zone B cells Increased proportion of marginal zone B cells"
 ## [1] "Decreased proportion of memory B cells Increased proportion of memory B cells"
 ## [1] "Decreased proportion of memory T cells Increased proportion of memory T cells"
 ## [1] "Decreased proportion of naive B cells Increased proportion of naive B cells"
 ## [1] "Decreased proportion of naive CD4 T cells Increased proportion of naive CD4 T cells"
 ## [1] "Decreased proportion of naive CD8 T cells Increased proportion of naive CD8 T cells"
 ## [1] "Decreased proportion of naive T cells Increased proportion of naive T cells"
 ## [1] "Decreased proportion of plasmablasts Increased proportion of plasmablasts"
 ## [1] "Decreased proportion of transitional B cells Increased proportion of transitional B cells"
 ## [1] "Decreased proportion of unswitched memory B cells Increased proportion of unswitched memory B cells"
 ## [1] "Decreased QRS voltage Increased QRS voltage"
 ## [1] "Decreased red blood cell count Increased red blood cell count"
 ## [1] "Decreased resting energy expenditure Increased resting energy expenditure"
 ## [1] "Decreased salivary cortisol level Increased salivary cortisol level"
 ## [1] "Decreased scrotal rugation Increased scrotal rugation"
 ## [1] "Decreased serum estradiol Increased serum estradiol"
 ## [1] "Decreased serum estriol Increased serum estriol"
 ## [1] "Decreased serum estrone Increased serum estrone"
 ## [1] "Decreased serum ferritin Increased serum ferritin"
 ## [1] "Decreased serum insulin-like growth factor 1 Increased serum insulin-like growth factor 1"
 ## [1] "Decreased serum iron Increased serum iron"

[1] "Decreased serum leptin Increased serum leptin"
 ## [1] "Decreased serum testosterone level Increased serum testosterone level"
 ## [1] "Decreased serum zinc Increased serum zinc"
 ## [1] "Decreased sialylated N-glycan level Increased sialylated N-glycan level"
 ## [1] "Decreased sialylation of N-linked protein glycosylation Increased sialylation of N-linked p
 ## [1] "Decreased size of the clitoris Increased size of the clitoris"
 ## [1] "Decreased skull ossification Increased skull ossification"
 ## [1] "Decreased superoxide dismutase level Increased superoxide dismutase level"
 ## [1] "Decreased T3/T4 ratio Increased T3/T4 ratio"
 ## [1] "Decreased total hemolytic complement activity Increased total hemolytic complement activity"
 ## [1] "Decreased total iron binding capacity Increased total iron binding capacity"
 ## [1] "Decreased uridine diphosphate glucose-4-epimerase level in plasma Increased uridine diphosph
 ## [1] "Decreased uridine diphosphate glucose-4-epimerase level in red blood cells Increased uridin
 ## [1] "Decreased urinary 1-methylhistidine Increased urinary 1-methylhistidine"
 ## [1] "Decreased urinary 3-methylhistidine Increased urinary 3-methylhistidine"
 ## [1] "Decreased urinary copper concentration Increased urinary copper concentration"
 ## [1] "Decreased urinary potassium Increased urinary potassium"
 ## [1] "Decreased urine alpha-ketoglutarate concentration Increased urine alpha-ketoglutarate conce
 ## [1] "Decreased urine urobilinogen Increased urine urobilinogen"
 ## [1] "Decreased VLDL cholesterol concentration Increased VLDL cholesterol concentration"
 ## [1] "Decreased waist to hip ratio Increased waist to hip ratio"
 ## [1] "Disproportionate short stature Proportionate short stature"
 ## [1] "Disproportionate tall stature Proportionate tall stature"
 ## [1] "Dysgerminoma Germinoma"
 ## [1] "Early chronotype Late chronotype"
 ## [1] "Early inspiratory crackles Late inspiratory crackles"
 ## [1] "Early spermatogenesis maturation arrest Late spermatogenesis maturation arrest"
 ## [1] "Fast-growing nails Slow-growing nails"
 ## [1] "Happy demeanor Unhappy demeanor"
 ## [1] "Heavy-chain paraproteinemia Light-chain paraproteinemia"
 ## [1] "High anterior hairline Low anterior hairline"
 ## [1] "High insertion of columella Low insertion of columella"
 ## [1] "High maternal serum alpha-fetoprotein Low maternal serum alpha-fetoprotein"
 ## [1] "High maternal serum chorionic gonadotropin Low maternal serum chorionic gonadotropin"
 ## [1] "High posterior hairline Low posterior hairline"
 ## [1] "High pulse pressure Low pulse pressure"
 ## [1] "High serum calcifediol Low serum calcifediol"
 ## [1] "High serum calcitriol Low serum calcitriol"
 ## [1] "High-frequency sensorineural hearing impairment Low-frequency sensorineural hearing impairm
 ## [1] "High-output congestive heart failure Low-output congestive heart failure"
 ## [1] "Hodgkin lymphoma Non-Hodgkin lymphoma"
 ## [1] "Ketotic hypoglycemia Nonketotic hypoglycemia"
 ## [1] "Large cell lung carcinoma Small cell lung carcinoma"
 ## [1] "Large earlobe Small earlobe"
 ## [1] "Large face Small face"
 ## [1] "Large for gestational age Small for gestational age"
 ## [1] "Large foramen magnum Small foramen magnum"
 ## [1] "Large forehead Small forehead"
 ## [1] "Large intestinal polyposis Small intestinal polyposis"
 ## [1] "Large placenta Small placenta"
 ## [1] "Large vessel vasculitis Small vessel vasculitis"
 ## [1] "Medial calcification of large arteries Medial calcification of small arteries"
 ## [1] "Medullary thyroid carcinoma Non-medullary thyroid carcinoma"
 ## [1] "Monoclonal elevation of IgG heavy chain Monoclonal elevation of IgG light chain"

```

## [1] "Neoplasm of the large intestine      Neoplasm of the small intestine"
## [1] "Non-obstructive azoospermia      Obstructive azoospermia"
## [1] "Non-restrictive ventricular septal defect      Restrictive ventricular septal defect"
## [1] "Non-secretory adrenocortical adenoma      Secretory adrenocortical adenoma"
## [1] "Non-small cell lung carcinoma      Small cell lung carcinoma"
## [1] "Nonopposable triphalangeal thumb      Opposable triphalangeal thumb"
## [1] "Nonproductive cough      Productive cough"
## [1] "Nonprogressive cerebellar ataxia      Progressive cerebellar ataxia"
## [1] "Nonprogressive encephalopathy      Progressive encephalopathy"
## [1] "Nonprogressive visual loss      Progressive visual loss"
## [1] "Nonprogressive      Progressive"
## [1] "obsolete Decreased proportion of CD4+ central memory cells      obsolete Increased proportion of
## [1] "Primary amenorrhea      Secondary amenorrhea"
## [1] "Primary Caesarian section      Secondary Caesarian section"
## [1] "Primary hyperaldosteronism      Secondary hyperaldosteronism"
## [1] "Primary hypercortisolism      Secondary hypercortisolism"
## [1] "Primary hyperparathyroidism      Secondary hyperparathyroidism"
## [1] "Secondary hyperparathyroidism      Tertiary hyperparathyroidism"
## [1] "Submucous cleft hard palate      Submucous cleft soft palate"
## [1] "Undetectable dark-adapted electroretinogram      Undetectable light-adapted electroretinogram"

## [1] "FOUND BY CHRIS, NOT BY ME:"

## [1] ""

## [1] "Tall stature      Short stature"
## [1] "Polyuria      Decreased urine output"
## [1] "Wide mouth      Narrow mouth"
## [1] "Macroglossia      Microglossia"
## [1] "Short upper lip      Long upper lip"
## [1] "Large fontanelles      Small fontanelle"
## [1] "Progressive microcephaly      Progressive macrocephaly"
## [1] "Small face      Large face"
## [1] "Narrow face      Broad face"
## [1] "Long face      Short face"
## [1] "Hypertelorism      Hypotelorism"
## [1] "Short philtrum      Long philtrum"
## [1] "Hypoplasia of the maxilla      Hyperplasia of the maxilla"
## [1] "Short chin      Tall chin"
## [1] "Broad forehead      Narrow forehead"
## [1] "Small forehead      Large forehead"
## [1] "Wide nose      Narrow nose"
## [1] "Short neck      Long neck"
## [1] "Microcornea      Megalocornea"
## [1] "Long eyelashes      Short eyelashes"
## [1] "Thick eyebrow      Thin eyebrow"
## [1] "Long palpebral fissure      Short palpebral fissure"
## [1] "Hypodontia      Increased number of teeth"
## [1] "Microdontia      Macrodontia"
## [1] "Hypoplasia of the thymus      Thymus hyperplasia"
## [1] "Hypothyroidism      Hyperthyroidism"
## [1] "Hypertension      Hypotension"
## [1] "Hypoparathyroidism      Hyperparathyroidism"

```


[1] "Increased circulating gonadotropin level Decreased circulating gonadotropin level"
 ## [1] "Hyperinsulinemia Hypoinsulinemia"
 ## [1] "Increased circulating renin level Decreased circulating renin level"
 ## [1] "Hyperaldosteronism Decreased circulating aldosterone level"
 ## [1] "Parathyroid hypoplasia Parathyroid hyperplasia"
 ## [1] "Long clavicles Short clavicles"
 ## [1] "Hypertrichosis obsolete Hypotrichosis"
 ## [1] "Broad palm Narrow palm"
 ## [1] "Large hands Small hand"
 ## [1] "Short umbilical cord Long umbilical cord"
 ## [1] "Hyporeflexia Hyperreflexia"
 ## [1] "Limitation of joint mobility Joint hypermobility"
 ## [1] "Onychogryposis Thin nail"
 ## [1] "Broad nail Narrow nail"
 ## [1] "Short toe Long toe"
 ## [1] "Long hallux Short hallux"
 ## [1] "Leukopenia Leukocytosis"
 ## [1] "Hypoglycemia Hyperglycemia"
 ## [1] "Hyperammonemia Hypoammonemia"
 ## [1] "Hypophosphatemia Hyperphosphatemia"
 ## [1] "Hyperuricemia Hypouricemia"
 ## [1] "Hypercalciuria Hypocalciuria"
 ## [1] "Hyperkalemia Hypokalemia"
 ## [1] "Hyperglycinemia Hypoglycinemia"
 ## [1] "Hypertriglyceridemia Hypotriglyceridemia"
 ## [1] "Increased CSF lactate Reduced CSF lactate"
 ## [1] "Pancreatic hypoplasia Pancreatic hyperplasia"
 ## [1] "Small foramen magnum Large foramen magnum"
 ## [1] "Thickened calvaria Thin calvarium"
 ## [1] "Lymphadenopathy Lymph node hypoplasia"
 ## [1] "Hypoventilation Hyperventilation"
 ## [1] "Decreased circulating total IgM Increased circulating IgM level"
 ## [1] "Hypocalcemia Hypercalcemia"
 ## [1] "Hyponatremia Hypernatremia"
 ## [1] "Hyperchloriduria Hypochloriduria"
 ## [1] "Hypomagnesemia Hypermagnesemia"
 ## [1] "Hypoalbuminemia Hyperalbuminemia"
 ## [1] "Hyperlipidemia Hypolipidemia"
 ## [1] "Increased urinary potassium Decreased urinary potassium"
 ## [1] "Hyperphosphaturia Hypophosphaturia"
 ## [1] "Hypochloremia Hyperchloremia"
 ## [1] "Increased circulating cortisol level Decreased circulating cortisol level"
 ## [1] "Hypercholesterolemia Hypocholesterolemia"
 ## [1] "Elevated alkaline phosphatase Low alkaline phosphatase"
 ## [1] "Hypermethioninemia Hypomethioninemia"
 ## [1] "Increased circulating IgG level Decreased circulating IgG level"
 ## [1] "Elevated serum creatinine Decreased serum creatinine"
 ## [1] "Increased serum ferritin Decreased serum ferritin"
 ## [1] "CNS hypomyelination CNS hypermyelination"
 ## [1] "Short palm Long palm"
 ## [1] "Increased body weight Decreased body weight"
 ## [1] "Increased skull ossification Decreased skull ossification"
 ## [1] "Reduced bone mineral density Increased bone mineral density"
 ## [1] "Increased circulating purine concentration Decreased circulating purine concentration"

[1] "Biconcave vertebral bodies Biconvex vertebral bodies"
 ## [1] "Short middle phalanx of finger Long middle phalanx of finger"
 ## [1] "Thyroid hypoplasia Thyroid hyperplasia"
 ## [1] "Long proximal phalanx of finger Short proximal phalanx of finger"
 ## [1] "Small placenta Large placenta"
 ## [1] "Broad femoral neck Narrow femoral neck"
 ## [1] "Peripheral hypomyelination Peripheral hypermyelination"
 ## [1] "Generalized hyperpigmentation Generalized hypopigmentation"
 ## [1] "Long upper eyelashes Short upper eyelashes"
 ## [1] "Macular hypopigmentation Macular hyperpigmentation"
 ## [1] "Foveal hyperpigmentation Foveal hypopigmentation"
 ## [1] "Increased muscle glycogen content Decreased muscle glycogen content"
 ## [1] "Increased adipose tissue Decreased adipose tissue"
 ## [1] "Enlarged epiphysis of the distal phalanx of the 5th finger Small epiphysis of the distal phalanx of the 5th finger"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the 5th finger Small epiphysis of the proximal phalanx of the 5th finger"
 ## [1] "Enlarged epiphysis of the middle phalanx of the 5th finger Small epiphysis of the middle phalanx of the 5th finger"
 ## [1] "Enlarged epiphysis of the middle phalanx of the 4th finger Small epiphysis of the middle phalanx of the 4th finger"
 ## [1] "Enlarged epiphysis of the distal phalanx of the 4th finger Small epiphysis of the distal phalanx of the 4th finger"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the 4th finger Small epiphysis of the proximal phalanx of the 4th finger"
 ## [1] "Enlarged epiphysis of the middle phalanx of the 3rd finger Small epiphysis of the middle phalanx of the 3rd finger"
 ## [1] "Enlarged epiphysis of the distal phalanx of the 3rd finger Small epiphysis of the distal phalanx of the 3rd finger"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the 3rd finger Small epiphysis of the proximal phalanx of the 3rd finger"
 ## [1] "Enlarged epiphyses of the 5th finger Small epiphyses of the 5th finger"
 ## [1] "Enlarged epiphyses of the 4th finger Small epiphyses of the 4th finger"
 ## [1] "Enlarged epiphyses of the 3rd finger Small epiphyses of the 3rd finger"
 ## [1] "Enlarged epiphyses of the 2nd finger Small epiphyses of the 2nd finger"
 ## [1] "Enlarged epiphysis of the distal phalanx of the 2nd finger Small epiphysis of the distal phalanx of the 2nd finger"
 ## [1] "Enlarged epiphysis of the middle phalanx of the 2nd finger Small epiphysis of the middle phalanx of the 2nd finger"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the 2nd finger Small epiphysis of the proximal phalanx of the 2nd finger"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the thumb Small epiphysis of the proximal phalanx of the thumb"
 ## [1] "Enlarged epiphysis of the distal phalanx of the thumb Small epiphysis of the distal phalanx of the thumb"
 ## [1] "Enlarged thumb epiphysis Small thumb epiphysis"
 ## [1] "Reduced number of teeth Increased number of teeth"
 ## [1] "Short distal phalanx of finger Long distal phalanx of finger"
 ## [1] "Enlarged epiphysis of the 1st metacarpal Small epiphysis of the 1st metacarpal"
 ## [1] "Short metacarpal Long metacarpals"
 ## [1] "Enlarged epiphyses of the hallux Small epiphyses of the hallux"
 ## [1] "Enlarged epiphysis of the proximal phalanx of the hallux Small epiphysis of the proximal phalanx of the hallux"
 ## [1] "Enlarged epiphysis of the distal phalanx of the hallux Small epiphysis of the distal phalanx of the hallux"
 ## [1] "Enlarged epiphysis of the 1st metatarsal Small epiphysis of the 1st metatarsal"
 ## [1] "Enlarged epiphyses of the toes Small epiphyses of the toes"
 ## [1] "Enlarged epiphyses of the phalanges of the hand Small epiphyses of the phalanges of the hand"
 ## [1] "Enlarged epiphyses of the distal phalanges of the hand Small epiphyses of the distal phalanges of the hand"
 ## [1] "Enlarged epiphyses of the middle phalanges of the hand Small epiphyses of the middle phalanges of the hand"
 ## [1] "Enlarged epiphyses of the proximal phalanges of the hand Small epiphyses of the proximal phalanges of the hand"
 ## [1] "Hyperpituitarism Hypopituitarism"
 ## [1] "Enlarged epiphyses Small epiphyses"
 ## [1] "Hypoplasia of the premaxilla Hyperplasia of the premaxilla"
 ## [1] "Broad uvula Narrow uvula"
 ## [1] "Long uvula Short uvula"
 ## [1] "Increased urinary copper concentration Decreased urinary copper concentration"
 ## [1] "Hyperlipoproteinemia Hypolipoproteinemia"
 ## [1] "Increased corneal thickness Decreased corneal thickness"
 ## [1] "Elevated circulating luteinizing hormone level Decreased circulating luteinizing hormone level"

```

## [1] "Erythroid hyperplasia      Erythroid hypoplasia"
## [1] "Granulocytic hyperplasia   Granulocytic hypoplasia"
## [1] "Monocytosis      Monocytopenia"
## [1] "Increased urine alpha-ketoglutarate concentration      Decreased urine alpha-ketoglutarate conce
## [1] "Hypocitraturia      Hypercitraturia"
## [1] "Enlarged pituitary gland      Small pituitary gland"
## [1] "Hyponatriuria      Hypernatriuria"
## [1] "Hypermagnesiuria      Hypomagnesiuria"
## [1] "Narrow jaw      Broad jaw"
## [1] "Increased serum testosterone level      Decreased serum testosterone level"
## [1] "Increased circulating androgen level      Decreased circulating androgen level"
## [1] "Chorioretinal hypopigmentation      Chorioretinal hyperpigmentation"
## [1] "Long lower eyelashes      Short lower eyelashes"
## [1] "Increased head circumference      Decreased head circumference"
## [1] "Increased size of the clitoris      Decreased size of the clitoris"
## [1] "Enlarged epiphyses of the 2nd toe      Small epiphyses of the 2nd toe"
## [1] "Enlarged epiphyses of the 3rd toe      Small epiphyses of the 3rd toe"
## [1] "Enlarged epiphyses of the 4th toe      Small epiphyses of the 4th toe"
## [1] "Enlarged epiphyses of the 5th toe      Small epiphyses of the 5th toe"
## [1] "Enlarged epiphysis of the distal phalanx of the 2nd toe      Small epiphysis of the distal phalan
## [1] "Enlarged epiphysis of the middle phalanx of the 2nd toe      Small epiphysis of the middle phalan
## [1] "Enlarged epiphysis of the proximal phalanx of the 2nd toe      Small epiphysis of the proximal p
## [1] "Enlarged epiphysis of the distal phalanx of the 3rd toe      Small epiphysis of the distal phalan
## [1] "Enlarged epiphysis of the middle phalanx of the 3rd toe      Small epiphysis of the middle phalan
## [1] "Enlarged epiphysis of the proximal phalanx of the 3rd toe      Small epiphysis of the proximal p
## [1] "Enlarged epiphysis of the distal phalanx of the 4th toe      Small epiphysis of the distal phalan
## [1] "Enlarged epiphysis of the middle phalanx of the 4th toe      Small epiphysis of the middle phalan
## [1] "Enlarged epiphysis of the proximal phalanx of the 4th toe      Small epiphysis of the proximal p
## [1] "Enlarged epiphysis of the distal phalanx of the 5th toe      Small epiphysis of the distal phalan
## [1] "Enlarged epiphysis of the middle phalanx of the 5th toe      Small epiphysis of the middle phalan
## [1] "Enlarged epiphysis of the proximal phalanx of the 5th toe      Small epiphysis of the proximal p
## [1] "Long ear      Short ear"

```

RO exploration

I extracted the terms from the current version of the RO, then got the absolute frequencies of their words:

```
/Users/kevincohen/Dropbox/Scripts-new/lexicalFrequency.pl experimental-outputs/ro.terms.txt
```

... which reveals imbalances in the use of words that are clear opposites, e.g.:

- during 11 before 4 after 2
- to 49 from 16 towards 1 *how about away?*
- directly 18 indirectly 8
- indirect 2 direct 2

... which suggests that I could be adding a bunch of opposite terms to the ontology.

So, I ran the current version of my antonym-finding script:

```
code/findAntonyms.pl resources/ontologies/ro.2021-03-08.obo.txt |wc -l
```

... which finds 43 pairs of opposites.

Next step: find overlap with Mike's resources/ontologies/predicates.txt.

For next weeks...

0. With Bill, reorganize repository and merge with TRANSLATOR's
1. Test cases in human-readable form
2. Handle substitutions (e.g. hypercalcemia vs. hypocalcemia)
3. Suffixes (e.g. hydrophilic vs. hydrophobic)
4. Word-internal, possibly (might produce a lot of false positives later when we do generation)

2021-04-15 report

Analysis of PATO opposites WRT the excluded middle

Motivation: this picks out a specific type of opposition: what Pustejovsky calls *polar*, meaning that there's a scale and the things at the two poles of the scale are opposites of each other.

How I assigned the excluded.middle value

0. If the middle is reasonably clearly excluded, I assigned the value *yes*. Examples: *acute/chronic*, *aerobic/anaerobic*. If that is not the case, then I put the "middle" value in the excluded.middle field. Example: for *phosphorylated/dephosphorylated*, I put the value *unphosphorylated* in the excluded.middle column.
1. Almost every pair that fits the pattern *increased/decreased x* has a mid-point or neutral point *normal x*.
2. Most pairs of the form *x/unx* (e.g. *responsive/unresponsive*) exclude the middle. Exception: *damaged/undamaged/repaired*.

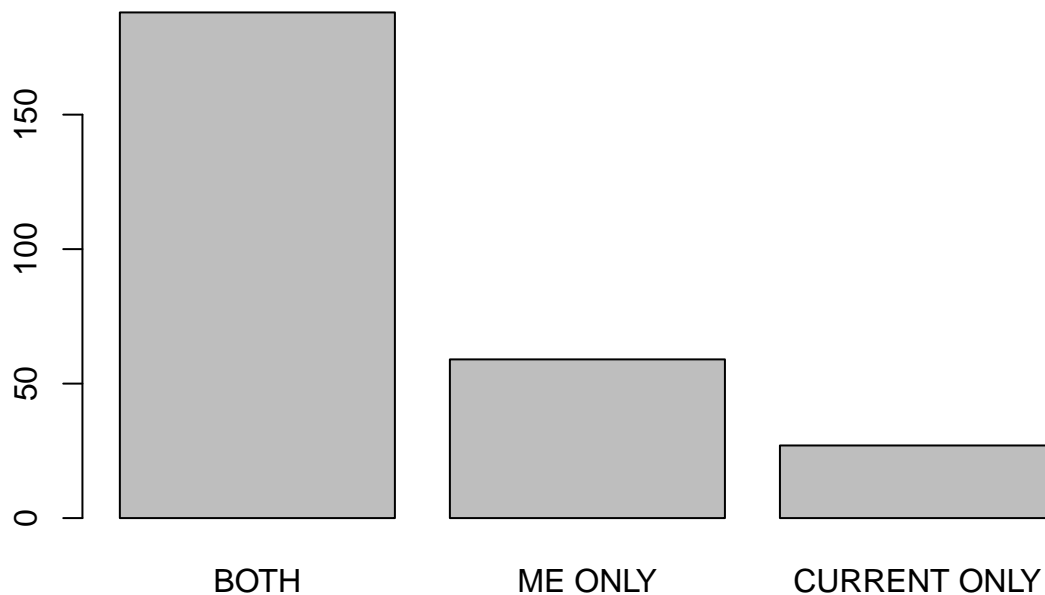
```
# "current" is the ones that Bill found currently in use
in.both <- read.table("/Users/kevincohen/Dropbox/N-Z/translator-concept-oppositeness/experimental-output")
in.mine.only <- read.table("/Users/kevincohen/Dropbox/N-Z/translator-concept-oppositeness/experimental-output")
in.current.only <- read.table("/Users/kevincohen/Dropbox/N-Z/translator-concept-oppositeness/experimental-output")

in.both$excluded.middle <- as.character(in.both$excluded.middle)
in.mine.only$excluded.middle <- as.character(in.mine.only$excluded.middle)
in.current.only$excluded.middle <- as.character(in.current.only$excluded.middle)
# in.both <- as_tibble(in.both)
# in.both <- mutate(in.both, found.by = "BOTH")
# in.mine.only <- as_tibble(in.mine.only)
# in.mine.only <- mutate(in.mine.only, found.by = "ME")
# in.current.only <- as_tibble(in.current.only)
# in.current.only <- mutate(in.current.only, found.by = "CURRENT")

# in.combined <- as_tibble(in.both, in.mine.only, in.current.only)

#ggplot(data = in.combined, mapping = aes(x = found.by, )) +
#  geom_bar(stat = "identity")

in.counts <- c(nrow(in.both), nrow(in.mine.only), nrow(in.current.only))
#in.counts <- as_tibble(in.counts, counts = in.counts)
barplot(in.counts, names.arg = c("BOTH", "ME ONLY", "CURRENT ONLY"))
```



```
# I CAN'T GET THIS TO WORK...
#excluded.middle.counts <- c()
##count.both <- nrow(select(in.both, in.both$excluded.middle == "yes"))
##select(in.both, in.both$excluded.middle == "yes")
##count.both <- nrow(in.both$term01[in.both$term01 == "yes"])
##count.both <- in.both[which(in.both$excluded.middle == 'yes')]

#count.mine <- nrow(in.mine.only$term01[in.mine.only$term01 == "yes"])
#count.current <- nrow(in.current.only$term01[in.current.only$term01 == "yes"])
#excluded.middle.counts <- c(count.both, count.mine, count.current)

#barplot(excluded.middle.counts, names.arg = c("BOTH", "ME ONLY", "CURRENT ONLY"))
```

For next weeks...

1. Test cases in human-readable form
2. Handle substitutions (e.g. hypercalcemia vs. hypocalcemia)
3. Suffixes (e.g. hydrophilic vs. hydrophobic)
4. Word-internal, possibly (might produce a lot of false positives later when we do generation)

For reproducibility

```
## R version 4.0.1 (2020-06-06)
## Platform: x86_64-apple-darwin17.0 (64-bit)
```

```

## Running under: macOS 10.16
##
## Matrix products: default
## BLAS: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRblas.dylib
## LAPACK: /Library/Frameworks/R.framework/Versions/4.0/Resources/lib/libRlapack.dylib
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods   base
##
## other attached packages:
## [1] ontologyIndex_2.7  ggVennDiagram_0.5.0 forcats_0.5.1
## [4] stringr_1.4.0      dplyr_1.0.4         purrr_0.3.4
## [7] readr_1.4.0        tidyr_1.1.1         tibble_3.0.1
## [10] ggplot2_3.3.2      tidyverse_1.3.0
##
## loaded via a namespace (and not attached):
## [1] Rcpp_1.0.4.6      lubridate_1.7.9     class_7.3-17
## [4] utf8_1.1.4        assertthat_0.2.1    digest_0.6.25
## [7] R6_2.4.1          cellranger_1.1.0    futile.options_1.0.1
## [10] backports_1.1.8   reprex_1.0.0        evaluate_0.14
## [13] e1071_1.7-3       httr_1.4.1          pillar_1.4.4
## [16] rlang_0.4.10      readxl_1.3.1        VennDiagram_1.6.20
## [19] rstudioapi_0.11   rmarkdown_2.3       labeling_0.3
## [22] munsell_0.5.0     broom_0.7.4         compiler_4.0.1
## [25] modelr_0.1.8      xfun_0.15           pkgconfig_2.0.3
## [28] htmltools_0.5.0   tidyselect_1.1.0    fansi_0.4.1
## [31] crayon_1.3.4      dbplyr_2.1.0        withr_2.4.1
## [34] sf_0.9-8          grid_4.0.1          jsonlite_1.7.0
## [37] gtable_0.3.0      lifecycle_0.2.0     DBI_1.1.0
## [40] magrittr_1.5      formatR_1.8         units_0.7-1
## [43] scales_1.1.1      KernSmooth_2.23-17  cli_2.0.2
## [46] stringi_1.4.6     farver_2.0.3        fs_1.4.1
## [49] xml2_1.3.2        futile.logger_1.4.3  ellipsis_0.3.1
## [52] generics_0.0.2    vctrs_0.3.6         lambda.r_1.2.4
## [55] tools_4.0.1       glue_1.4.1          hms_1.0.0
## [58] yaml_2.2.1        colorspace_1.4-1    classInt_0.4-3
## [61] rvest_0.3.6       knitr_1.29          haven_2.3.1

```