

## 1.1 Some Very Useful Numbers for human population genetics.

When you're thinking about genomes and genomic data it's often useful to have a sense of rates and scales<sup>1</sup>.

### Genome properties.

**Genome size:** 3.1 Gb (haploid size).

**Number of chromosomes:** 23 pairs

**Number of coding genes:** ~20,000

**Exons per gene:** 8 (median)

**Number of genes per megabase:** 6.5 (mean)

**Total in protein-coding exons:** 1% of genome

**Total in genes (introns+exons):** 40% of genome

**Active chromatin (per cell type):** 1% of genome

**Active chromatin (all cell types):** 13% of genome

### Length scales. (Orders of magnitude.)

**Transcription factor binding site:** 10 bp

**Enhancer:** 100 bp – 1 Kb

**Exon (coding):** 150 bp

**Coding length per gene:** 1200 bp (median)

**Intron:** 1 – 50 Kb

**Gene (pre-mRNA):** 10 – 100 Kb

**Extent of LD:** 10 Kb – 1 Mb (varies by locus & population)

**Enhancer–promoter interactions:** 1 Kb – 1 Mb

**Chromatin topological domains (TADs):** ~1 Mb

**Chromosome lengths:** 47 Mb – 250 Mb

### Genetic variation.

**Heterozygosity:**  $0.5\text{--}1.0 \times 10^{-3}$  (varies by population)

**Human-Chimpanzee divergence:**  $1.4 \times 10^{-2}$

**Number of common SNPs:** ~8 million (at > 5% MAF in global sample)

**Number of SNPs for genome-wide SNP tagging:** ~1 million

**Fst between populations:** ~0.10–0.15 between continents

### Population genetic parameters.

**Mutation rate per generation:**  $1.3 \times 10^{-8}$  per basepair (at parental age 30)

**Mutation rate per year:**  $4.0 \times 10^{-10}$  per basepair

**Number of mutations per child:** ~70

**Recombination rate:** 1.2 centiMorgans per Mb (mean, sex-averaged)

**Cross-overs per egg:** ~42

**Cross-overs per sperm:** ~26

**Effective population size:** 10,000–20,000 ( $H/4\mu$ )

### Timescales of population divergence. (Take with grain of salt)

**Human to chimpanzee:** 6.5 MY

**Human to Neanderthal/Denisovan:** 600 KY

**Deepest human population splits:** ~200 KY

**Out-of-Africa migration:** 65–100 KY

**Deepest non-African splits:** 65 KY

## Notes and References.

<sup>1</sup>Here's an excellent book-length treatment of this topic, with a focus on cell biology, free online [[Link](#)]:  
Milo R, Phillips R. *Cell biology by the numbers*. Garland Science; 2015