Teaching plan for Biostatistics course T-624-LIFT, Nov 2015 5 days

Date	Day	Topic	Materials	Lecture notes	Participants
	z 1-3	DNA, chromosomes, genes. Recombination. Pedigrees. Genetic inheritance. Kinship coefficient.	SR Ch. 1-2	Andrei Manolescu from previous talks; Paul Iordache slides	UMF Carol Davila
	z 1-3	Elements of statistical genetics. Allele and genotype frequencies. Hardy-Weinberg equilibrium. Risk and odds ratios. Allele and genotype association. Multiplicative, dominant, and recessive models. Haplotypes. Linkage disequilibrium.	SR Ch. 3	Andrei Manolescu notes	UMF Carol Davila
	z 1-3	Introduction to cancer genetics. Examples: 8q24 locus in prostate cancer, other cancer projects at Decode.	SR Ch. 18; Selected publications by Decode Genetics	Paul Iordache, cancer biology and research plan in RomCan; Thorunn Rafnar, invited contribution	UMF Carol Davila
	z 4-8	Simple and complex phenotypes. Mendelian vs. complex characters. Polygenic model. LD blocks and haplotypes. Tagging SNP's. HapMap project. DNA sequencing. Celera Human Genome Project. Disease studies. Genetic markers. Microsatellites and SNP's. Copy-number variations.	MA Ch. 2, 3, 9; EG Ch. 5	Andrei Manolescu notes; Bjarni Halldórsson Lecture 18,19	UMF+INSP
	z 1-3	Statistical inference. Hypothesis testing. Likelihood principle. Multiple testing. Bonferroni correction.	MA Ch. 1-2; EG Ch. 3 and 8; StatSoft	Bjarni Halldórsson Lectures 5,6,9	UMF
	z 4-8	Genetic association. Fisher exact test. Pearson statistics and chi-squared test. Genome-wide association studies. Population controls. Example: myocardial infarction.	MA Ch. 5; Anna Helgadóttir et al., Science **316**, 1491 (2007).	Andrei Manolescu notes and slides	UMF+INSP
	z 1-3	Introduction to R software. SNP genotypes. Statistical analyses using genetic data. Quantitative analyses. Linear regression. Logistic regression. Examples: osteoporosis, smoking, and others. Formulation of individual mini projects for the students attending the course. Introduction to data being used.	MA Ch. 9; Online documentation of R software	Paul Iordache, Andrei Manolescu, Bjarni Halldórsson, collection of examples	UMF
	z 4-8	Population stratification. Genetic admixture. Example: myocardial infarction in African Americans. Student presentations.	MA Ch. 6; Anna Helgadóttir et al., Nature Genetics **38**, 68 (2006).	Andrei Manolescu notes and slides	UMF+INSP
	z 4-8	Candidate gene approach. Haplotype association. Example: FLAP gene in myocardial infarction. Rare genetic variants and recent examples.	Anna Helgadóttir et al., Nature Genetics 36, 233 (2004), and other Decode papers	Patrick Sulem, invited contribution on rare variants.	UMF+INSP
	z 4-8	Gene-environment and gene-gene interactions. Correlation tests with R. Gene expression and microarrays. QTL analysis.	MA. Ch. 7; SR Ch. 8	Bjarni Halldórsson Lecture 15,16	UMF+INSP
	z 4-8	Clustering of data. Geometric and other methods. Gene networks. Presentation of student mini projects.	SR Ch. 8; StatSoft; B. Halldórsson and R. Sharan, J. Mol. Biol. **425**, 3964 (2013)	Bjarni Halldórsson Lecture 19; Andrei Manolescu notes and slides	UMF+INSP