

Пример контрольных вопросов

Стандартные проблемы

----- Exam Questions 1 -----

***** Problem 1 *****

In a sample, the following distribution of genotypes was obtained:

AA	AB	BB
302	167	31

Questions:

- * What is the frequency of 'B' allele?
- * What is the distribution expected under HWE?
- * Compute the chi-square test for HWE
- * Is deviation from HWE significant?

***** Problem 2 *****

Design: case-control

Data:

	Factor Absent	Factor Present
Control	298	76
Case	86	40

Questions:

- * Characterize the strength of association between the disease and the risk factor
- * Compute the value of score test for association in this data
- * Is association significant? (use $p\text{-value} < 0.05$ as significance threshold)

***** Problem 3 *****

Data:

Trait	Genotype
1	5.2 1
2	6.0 1
3	4.5 0
4	5.6 0
5	4.4 0
6	6.1 2
7	4.9 1
8	5.9 0
9	6.1 2
10	5.2 0

Questions:

- * What is the variance of the trait?

- * What is the variance of the genotype?
- * What is covariance between the trait and the genotype?
- * What is the coefficient of regression of the trait onto genotype?
- * What is correlation between the trait and the genotype?
- * Compute the score test for association between the trait and the genotype
- * Is association significant (use p-value < 0.05 to claim significance)?

***** Problem 4 *****

Data:

	beta	se
Study 1	0.85	0.37
Study 2	0.49	0.34
Study 3	0.30	0.37

Questions:

- * Is association significant in any individual study? Which ones?
- * Perform meta-analysis. What is the value of meta-analysis beta?
- * What is the value of meta-analysis se?
- * What is the value of meta-analysis test statistic?
- * Is association significant in meta-analysis (p<0.05)?

Отвeты

----- Answers 1 -----

***** Problem 1 *****

Frequency of 'B' allele is 0.229

Expected distribution is 297.2205 176.559 26.2205

Test value = 1.465599

No significant deviation from HWE

***** Problem 2 *****

Odds Ratio = 1.823745

Score test statistics = 6.904763

Association IS significant at p=0.05

***** Problem 3 *****

Variance of the trait: 0.4187778

Variance of the genotype: 0.6777778

Covariance: 0.3077778

Regression T onto G: 0.734943

Correlation: 0.5776992

T2: 3.337364

Association is NOT significant at p=0.05

***** Problem 4 *****

There is significant association in study(es) Study 1

Beta: 0.5433877

SE 0.207347

T2: 6.867902

Association IS significant at $p=0.05$

Дополнительные вопросы

1.Равновесие Х-В в случае локуса с произвольным числом аллелей. Число степеней свободы теста на равновесие Х-В в случае локуса с 8 аллелями

2.Причины отклонения от равновесия Х-В.

3.Номинальное p-value при GWAS. Почему?

4.Значимость и p-value. Поправка Бонферрони. Эксперимент с 5 независимыми испытаниями

5.Мета-анализ GWAS. Методы. Зачем?

6.Популяционная стратификация (генетическая гетерогенность выборки). Концепция. Почему важно? Метод геномного контроля.

7. RR и OR. Что когда? Почему?