**Math, Genes, and You**

Week 5, Day 1: Complex Traits

**Plan for today**

Genetics news

Lecture: Complex Traits

Group projects

**Definitions**

**Complex** – A trait that is influenced by many genes. Example: height. Also called **polygenic**.

**Case** – Individuals who have the trait or disease of interest. Example: 5,000 lung cancer **cases**.

**Control** – Individuals who do not have the trait or disease of interest. Example: 10,000 lung cancer **controls**.

**Odds Ratio** – A measure of the strength of the association between a trait and a genetic variant. Interpreted as “Each additional allele results in times greater odds of the trait.” Calculated by the following formula:

**Examples**

**Example 1:** Calculate the odds ratios for red hair color at the following genetic variants. Which appears to have the strongest effect on the trait?

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Gene** | **N(A;CASE)** | **N(A;CONTROL)** | **N(B;CASE)** | **N(B;CONTROL)** | **OR** |
| *MC1R* | 51 | 207 | 101 | 2,909 | 7.1 |
| *FANCA* | 49 | 207 | 103 | 2,909 | 6.7 |
| *CDK10* | 105 | 2,851 | 47 | 263 | 0.2 |
| *DEF8* | 98 | 933 | 54 | 2,183 | 4.2 |
| *MC1R* | 20 | 51 | 132 | 3,065 | **9.1** |

**Problem set 4**

1. Assume the shaded individuals in the following pedigree have a trait that is considered dominant. What are the possible genotypes of the parents? How would this change if the trait were recessive?
2. Calculate the odds ratio for the following variant:

|  |  |  |
| --- | --- | --- |
| **Genotype** | **N Cases** | **N Controls** |
| AA | 7 | 1 |
| AB | 5 | 5 |
| BB | 0 | 2 |

1. If a trait has baseline odds of 4 with AA genotype and odds ratio of 0.75 at this variant, what will be the odds with AB genotype? With BB genotype?