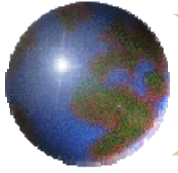


*What happens if I can only
count, not measure? (Chi-
square test)*

Vinjar Fønnebø



Types of data

⊕ Continuous variables

- Can be measured with an unlimited degree of precision

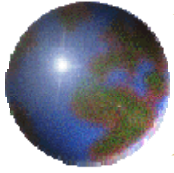
⊕ Categorical variables

■ Nominal

- The values have no numerical relation to each other

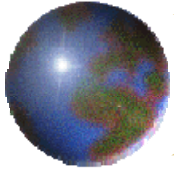
■ Ordinal

- The values have a numerical relation to each other, but they are not continuous



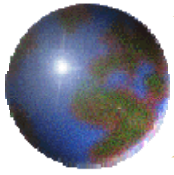
Types of data

- ⊕ Height
- ⊕ Number of children
- ⊕ Religious affiliation
- ⊕ Hemoglobin
- ⊕ Political attitude
- ⊕ Age

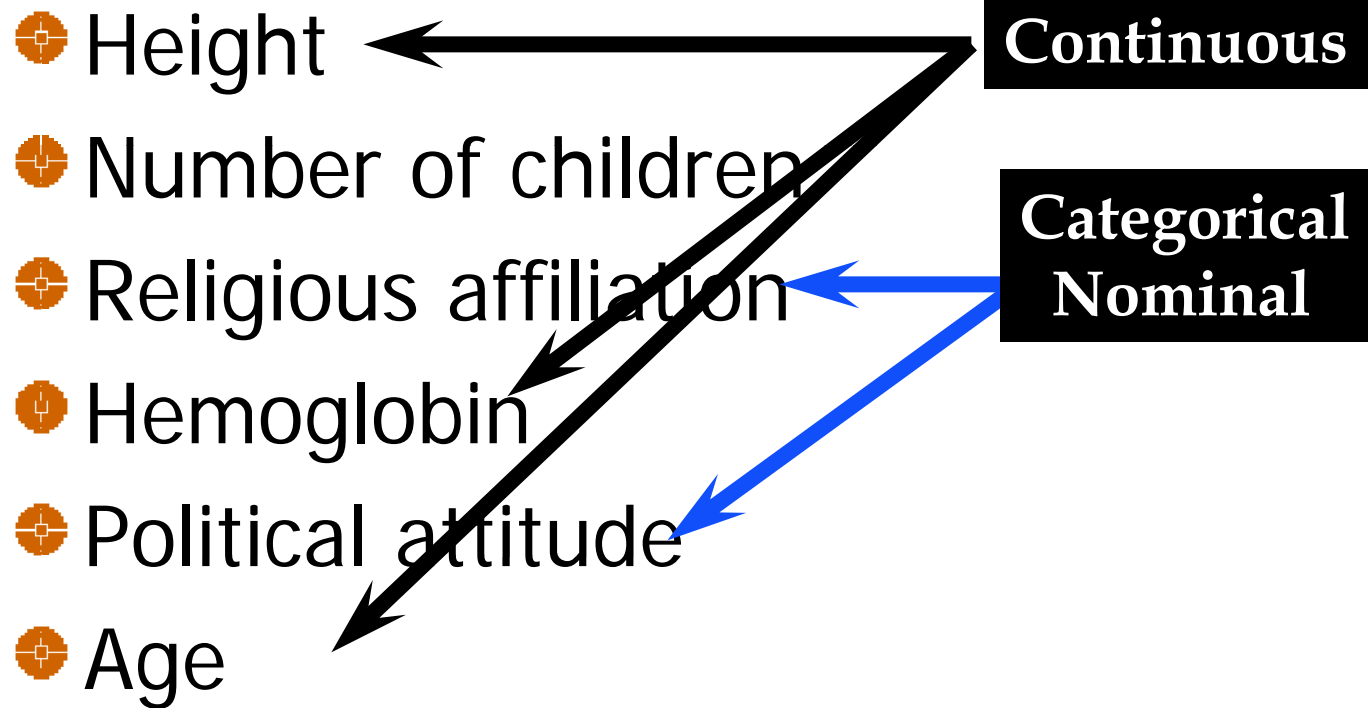


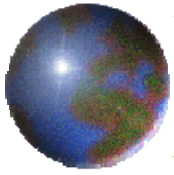
Types of data

- ⊕ Height
 - ⊕ Number of children
 - ⊕ Religious affiliation
 - ⊕ Hemoglobin
 - ⊕ Political attitude
 - ⊕ Age
- Continuous**
-
- A black box containing the word "Continuous" has three arrows pointing to the words "Height", "Hemoglobin", and "Age" in the list above.

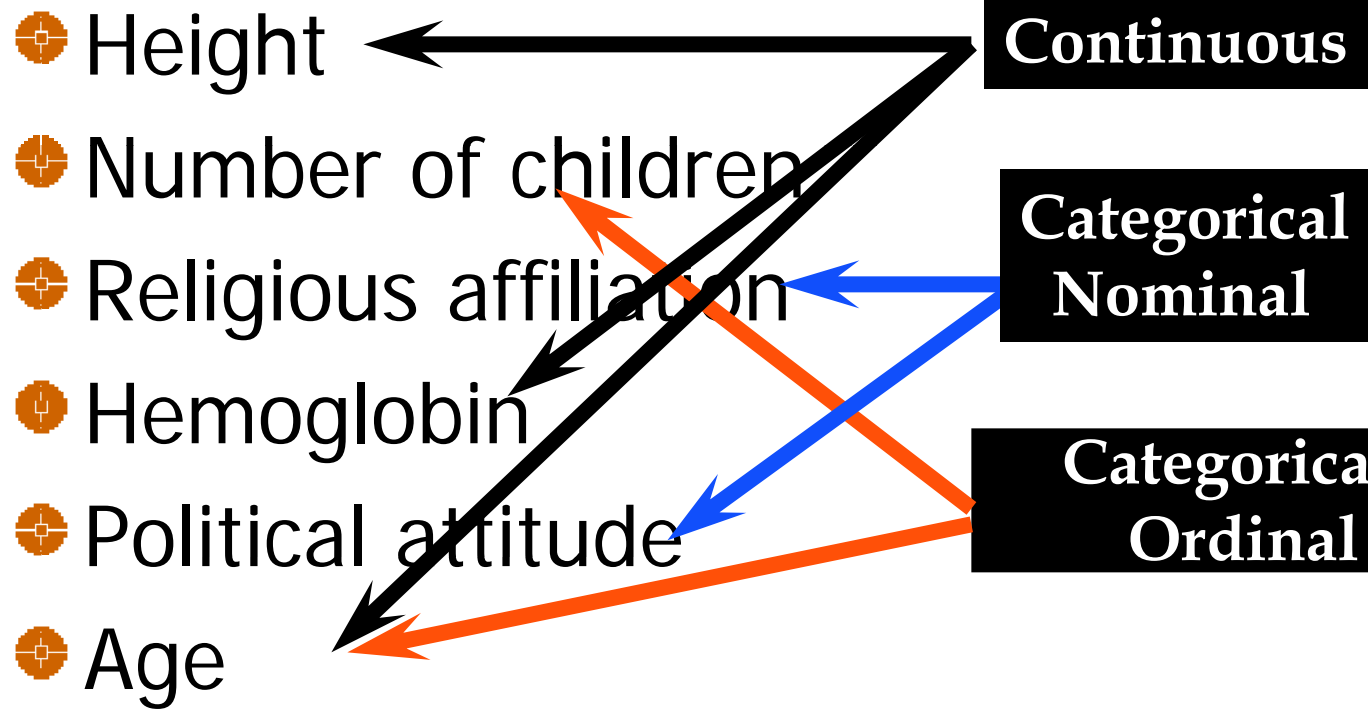


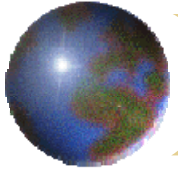
Types of data





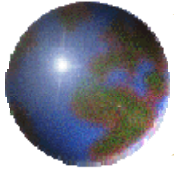
Types of data





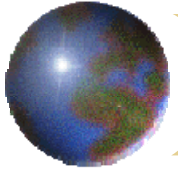
Testing

- Comparison of categorical variables
 - Impossible to calculate mean and standard deviation
 - Must compare proportions in the various groups
 - Republicans among men and women



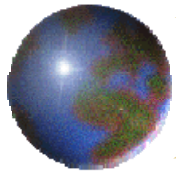
Testing

	Men	Women	
Republican	64	52	116
Democrat	36	48	84
	100	100	200



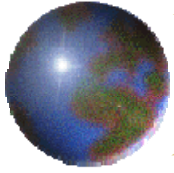
Testing

- Is the Republican proportion different among men and women
- Hypothesis value???
- They have the same proportion, but how do we find it???



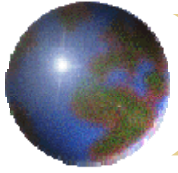
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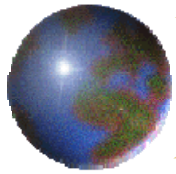
Testing

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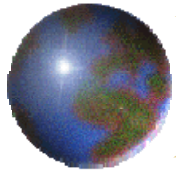
Testing

- The hypothetical proportion is then applied to each sex group
- Thereby we find how many Republicans each sex would have if the hypothesis value (null hypothesis) were true



Testing

	Men	Women	
Republican	58	58	
	64	52	116
Democrat	42	42	
	36	48	84
	100	100	200



Men **Women**

Republican

58

58

64

52

116

Democrat

42

42

36

48

84

100

100

200

$$\chi^2 = (O_1 - F_1)^2 / F_1 + (O_2 - F_2)^2 / F_2 + (O_3 - F_3)^2 / F_3 + (O_4 - F_4)^2 / F_4$$



Men **Women**

Republican

58

58

64

52

116

Democrat

42

42

36

48

84

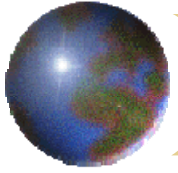
100

100

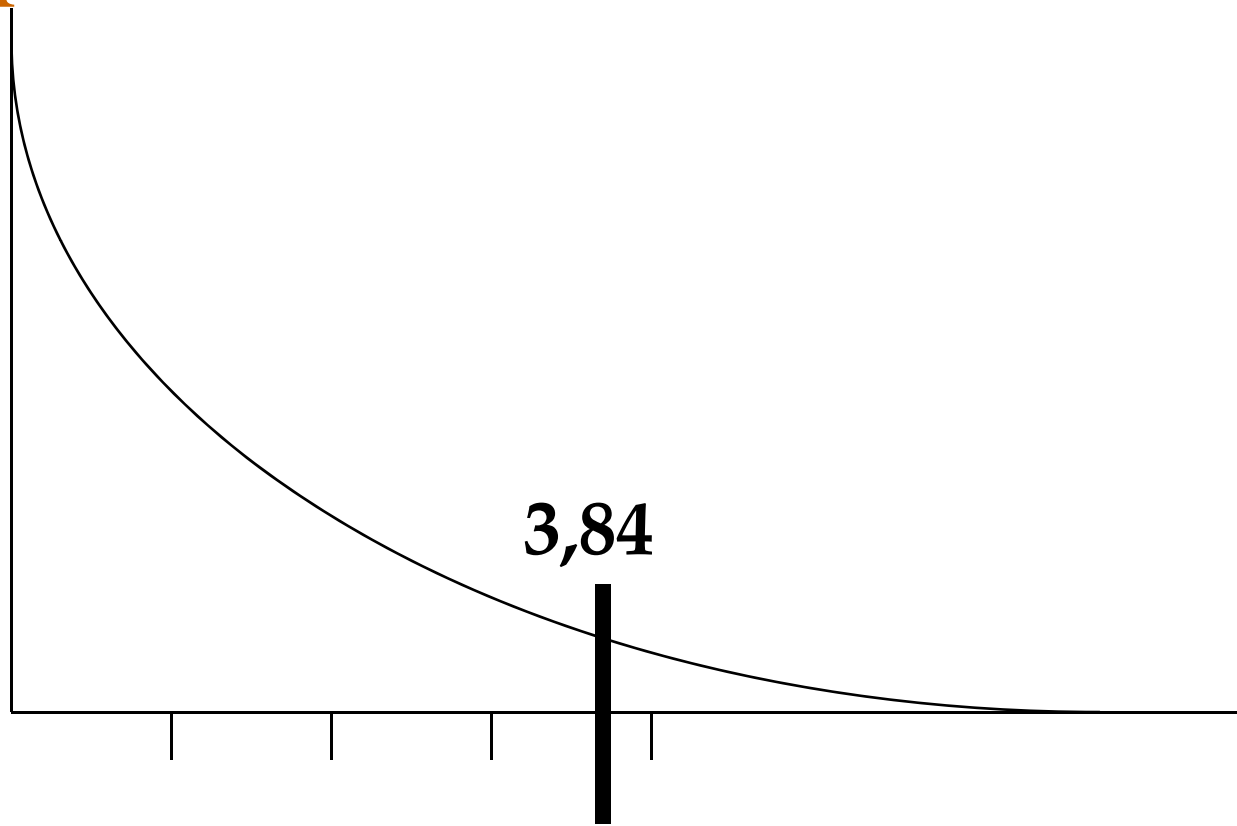
200

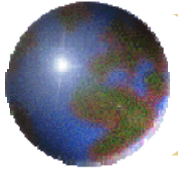
$$\chi^2 = (O_1 - F_1)^2 / F_1 + (O_2 - F_2)^2 / F_2 + (O_3 - F_3)^2 / F_3 + (O_4 - F_4)^2 / F_4$$

Example: $(64 - 58)^2 / 58 + (52 - 58)^2 / 58 + (36 - 42)^2 / 42 + (48 - 42)^2 / 42 = 2.96$

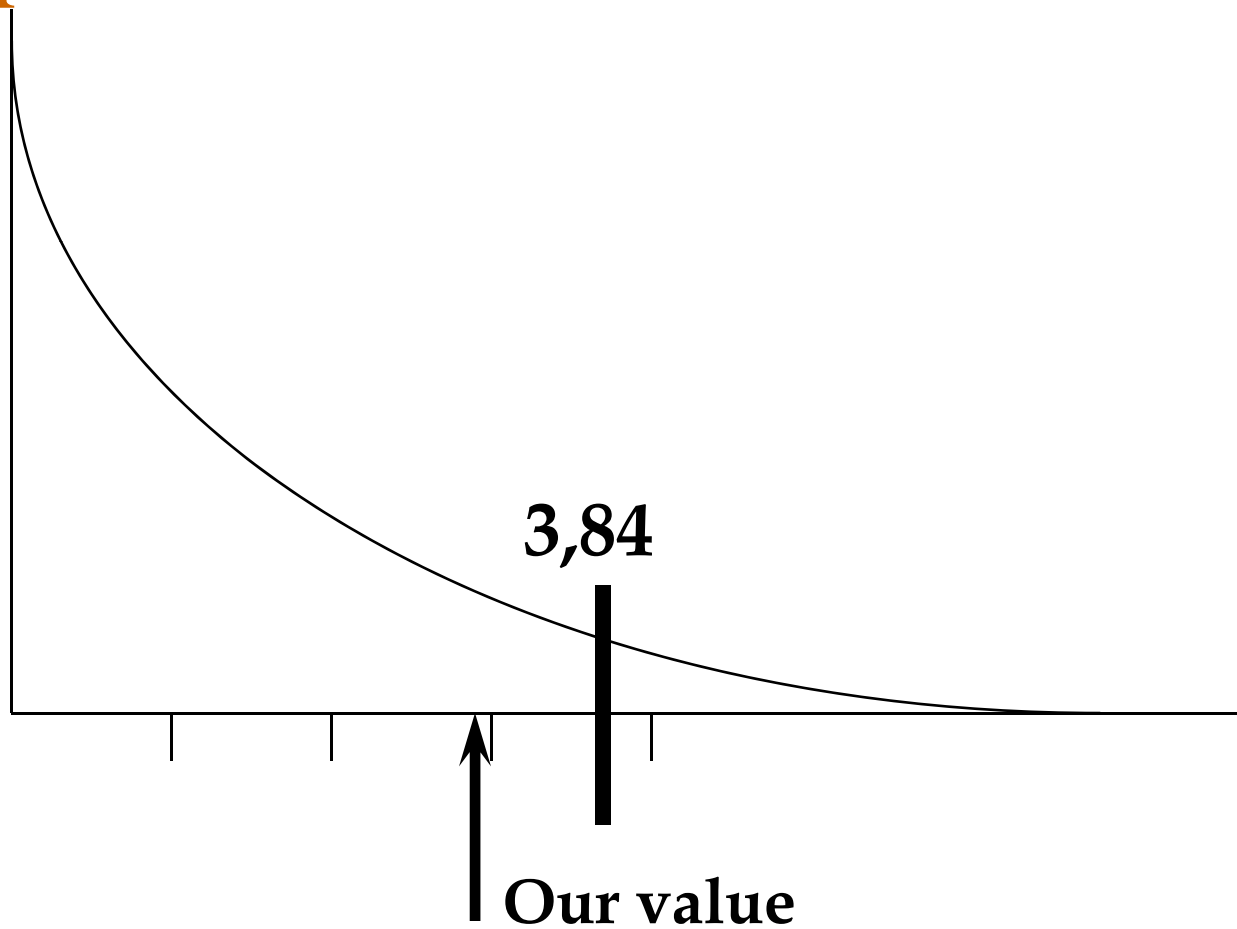


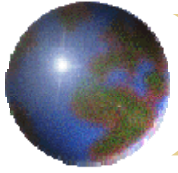
Chi-square distribution





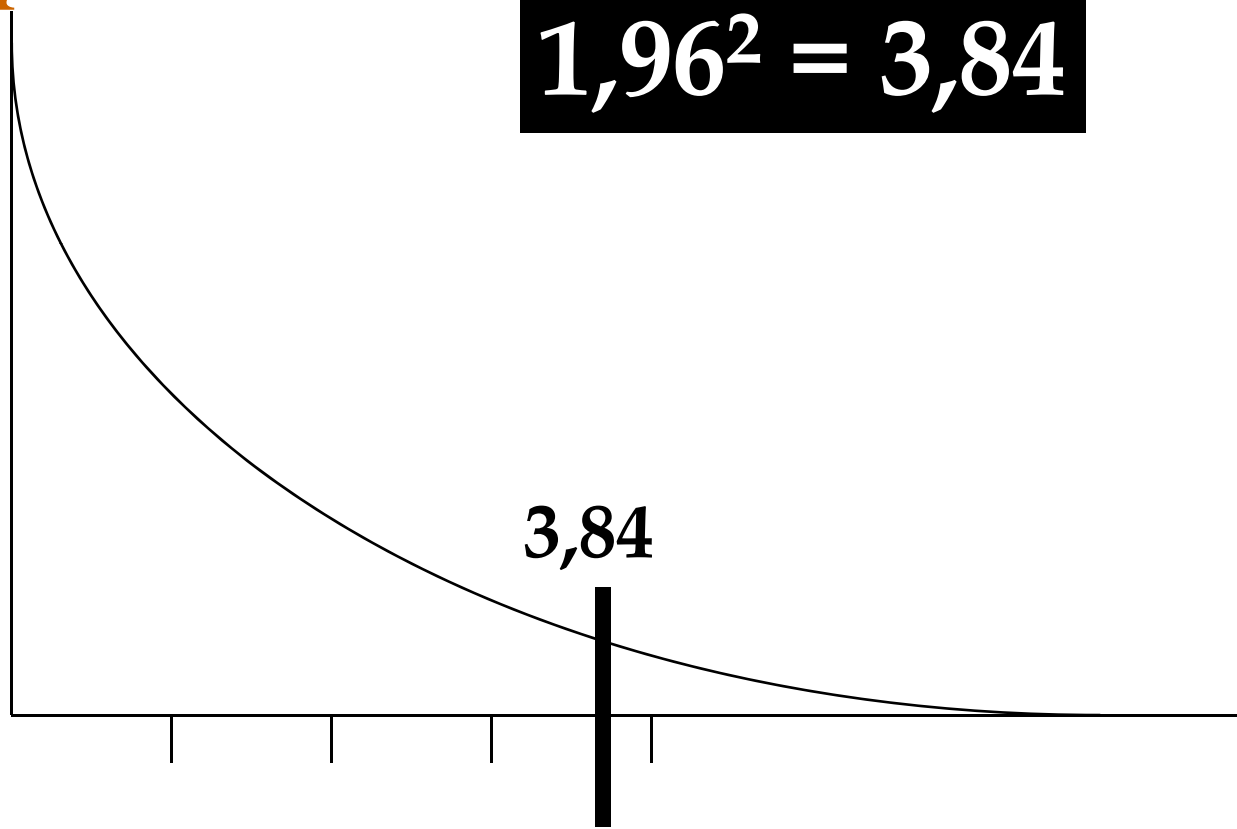
Chi-square distribution

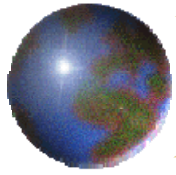




Chi-square distribution

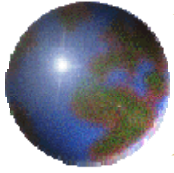
$$1,96^2 = 3,84$$





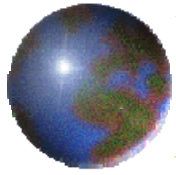
If we can only count...

- The statistical test formula is in principle the same



Statistics can be
dry and boring,
but...





- Statistics can be dry and boring, but...
- Sometimes it can lead you into an exciting world of mysteries to be solved and riddles to be worked out

