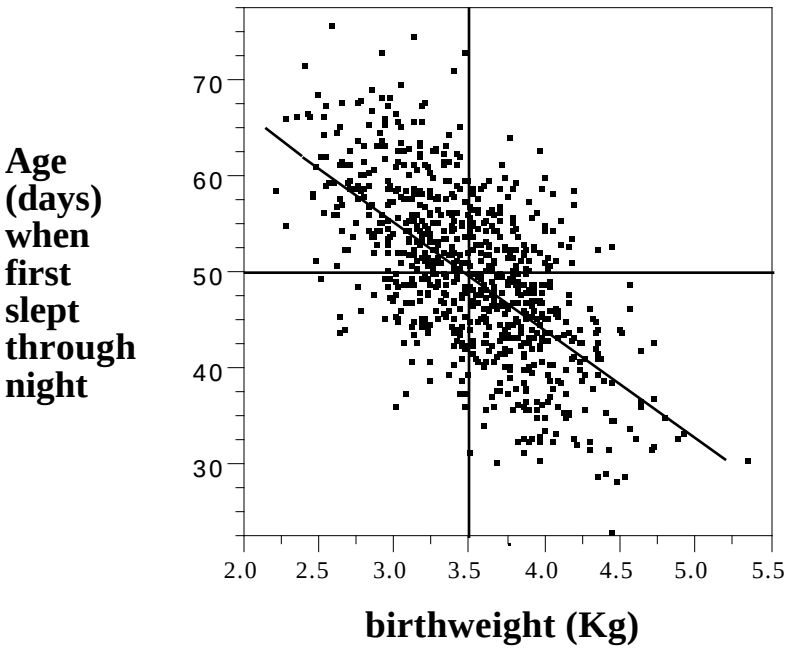
Sleeping through the night

A study of 800 babies examined the relationship between their weight at birth and the age at which they first slept through the night. The birth weights averaged 3.5 Kg with an SD of 0.5 Kg. The ages at which they first slept all night averaged 50 days with an SD of 10 days [JH's consultants on these data believe that both the mean and the SD for this latter variable should be much larger!]. The correlation between the two variables was –0.60. Here is a rough scatterplot of what the raw data look like.



Questions

a What is the equation of the regression line.?

- use the "centered" form: $\mu_{y|x} = \mu_y + \beta (x - \mu_x)$

Hint: beta_hat and r are related through equation 6.2 (p88)

b If the birthweights were in grams rather than Kg, what would β be?

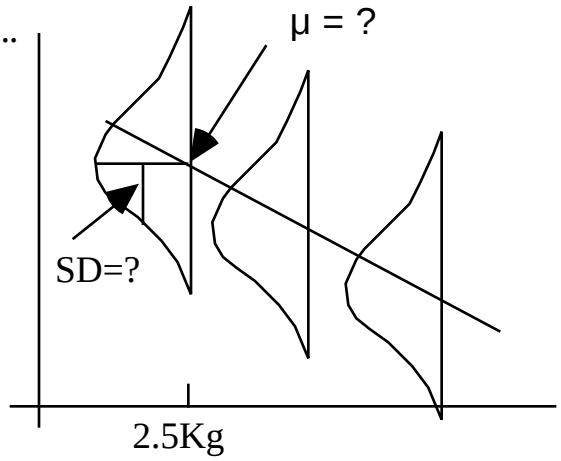
What would the correlation be?

Likewise, if the age was measured in weeks, what would change?

c If we consider a baby that weighed 2.5 Kg at birth, what is the probability that it will sleep through the night before it is 10 weeks (70 days) old? You don't need to DO the calculation, just indicate HOW to. What distributional assumptions do you have to make?

d If we consider all babies that weigh 2.5 Kg at birth, what is the probability that the average age at which they will first sleep through the night is less than 70 days?

Hint....



Answers

If text between *'s is formatted as hidden.
select it and use the Format//Character menu to "unhide" it.
If it won't print, change to "Print Hidden Text" when printing.

key features:

- *axes birthweight on x-axis; age on y-axis; scales on each axis*

  if Weights are Gaussian, then most from 3.5Kg–2SD = 2.5 KG to 3.5Kg + 1Kg = 4.5Kg

  likewise, from 50–2(10) to 50+2(10) for age i.e. from 30 to 70 days

- *negative correlation so low birthweight<--> later age and vice versa*

- *r = –0.6 means that the variance of y's at any x = 1 – (-0.6)^2 = 64% of overall variance in y (assuning bivariate "normality")*

  i.e. SD(Y | x) = 80% of SD in all y's i.e 80% of 10 or 8 days. much scatter in indiv. y's at each x

a What is the equation of the regression line.?

* *

b If the birthweights were in...

* *c If we consider **a** baby that weighed 2.5 Kg...

* *

d If we consider **ALL** babies that weigh 2.5 Kg at birth....

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