

Jane's Children

Solution

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There is deliberately not enough information to select a unique probability. The point is to ask how the child was encountered.

Even after making the usual simplified assumption that each child is independently equally likely to be a boy or a girl, there are different reasonable observation procedures.

One way to get $1/3$

Suppose a family is selected uniformly from families known to have at least one boy, and you then meet a boy from that family. Before this information, the four ordered possibilities are equally likely:

$$BB, \quad BG, \quad GB, \quad GG.$$

Here the first letter refers to the older child. Learning only that there is at least one boy rules out GG and leaves three equally likely possibilities. Only BB has two boys, so the probability is $1/3$.

One way to get $1/2$

Suppose instead that one of Jane's two children is selected at random, independently of the children's genders, and the selected child turns out to be a boy. The other child's gender remains equally likely to be boy or girl, so the probability of two boys is $1/2$.

In terms of the four family types, BB always produces a boy when a child is selected, while BG and GB do so only half the time. Among observations of a boy, BB therefore has twice the weight of either mixed family. Its share is $2/(2 + 1 + 1) = 1/2$.

What about the camp?

The camp story does not specify how attendance or the encounter works. Are families with two boys twice as likely to produce an encounter? Is one child per family selected? Do both boys attend, but you are equally likely to encounter a family regardless of how many attend? Those rules can change the answer.

The second example is an observation model, not a claim that a girl would attend this particular boys' camp. It shows why meeting a particular boy is not automatically the same evidence as selecting a family conditioned on having at least one boy.

So $1/3$ and $1/2$ are answers to *different completed versions* of the question. Neither follows from the camp sentence alone. Other selection rules can give other probabilities as well.

History and sources: [companion history PDF](#).