We often hear about conflicting results of even carefully done epidemiologic studies, and this can make us crazy! Which one should we believe? Is hormone replacement therapy good or bad? Is drinking coffee good for you or bad? And is modest alcohol consumption beneficial or harmful? What is the right answer?

I think that many of these conflicting reports are due to incomplete control of confounding factors, by which I mean other risk factors that are distributed unequally among the groups that are being compared.

Ken Rothman and others use a study by Stark and Mantel to illustrate the key features of confounding. These authors investigated the association between birth order and the risk of Down syndrome. This first graph shows a clear trend toward increasing prevalence of Down syndrome with increasing birth order, or an association between increasing birth order and risk of Down syndrome.

A 5th born child appears to have roughly a 4-fold increase in risk of being born with Down syndrome. Results like this also invite us to think about the mechanisms by which this occurred. Why might birth order cause a greater risk of Down syndrome? Keep in mind that this analysis does not consider any other "risk factors" besides birth order.

However, consider also that the order in which a women's children are born is also linked to her age at the time of her child's birth. When Stark and Mantel examined the relationship between maternal age at birth and risk of the child having Down syndrome, they observed the relationship depicted in this bar graph. This shows an even more striking relationship between maternal age at birth and the child's risk of being born with Down syndrome.

Obviously, women giving birth to their fifth child are on average, older than women giving birth to their first child. In other words, birth order of children is mixed up with maternal age when a child is born. The correlation between maternal age and prevalence of Down syndrome is much stronger than the correlation with birth order, and a woman having her 5th child is clearly older than when she gave birth to her previous children. In view of this, the relationship between birth order and prevalence of Down syndrome is confounded by age. In other words, the association between birth order and Down syndrome is exaggerated by the confounding effect of maternal age.

But is the converse also true? Is the effect of maternal age confounded by birth order? It is possible, but only if birth order really has some independent effect on the likelihood of Down syndrome, i.e. an effect independent of the fact that birth order is linked to maternal age.

We’ll take a closer look at this data in this week’s module and you will develop the skills you need to sort this out.