

VOA 2017-Down-Syndrome 1

Down Syndrome by Birth Order & Mom's Age

by
Milo Schield
*Member: International Statistical Institute
US Rep: International Statistical Literacy Project
Director, W. M. Keck Statistical Literacy Project*

*Slides and Data at: www.StatLit.org/pdf/2017-Schild-Downs-Syndrome-Slides.pdf
[xls/2017-Schild-Downs-Syndrome-Data.xlsx](http://www.StatLit.org/xls/2017-Schild-Downs-Syndrome-Data.xlsx)*

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Down Syndrome


Each person has 23 chromosome pairs.
Chromosomes are small "packages" of genes.
Down syndrome is a defect in chromosome 21.

Down syndrome is a genetic defect.
It is not the most common genetic defect.
It is #3 after cystic fibrosis & Huntington's disease.

About 6,000 US babies/year have Down syndrome.

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Down Syndrome Kids



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Down Syndrome: Common Health Problems

- Hearing loss (up to 75%)
- Obstructive sleep apnea (between 50 -75%)
- Ear infections (between 50 -70%)
- Eye diseases like cataracts (up to 60%) Heart defects present at birth (50%)

Disease: Symptoms with a definite cause.
Syndrome: Symptoms without a definite cause.
Usage may linger after cause is identified.

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Down Syndrome Kids



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Down Syndrome Adults: Intelligence & Behavior

Average IQ of *Down syndrome* adult:
50: the mental ability of a 9-year-old
Down syndrome kids: slower to speak.

Down-syndrome child-behavior problems:

- negativity, impulsivity,
- oppositional behavior, inattention,
- noncompliance, and disobedience, especially as they get older.

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Some Down Syndrome Kids Excel



Actors:
Chris Burke played Corky in *Life Goes On*
Lauren Potter plays Becky Jackson on *Glee*

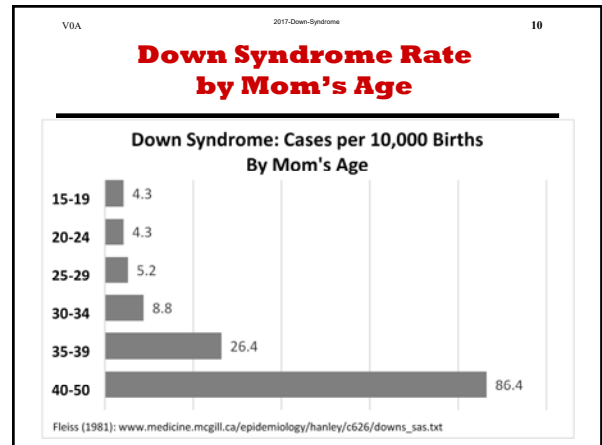
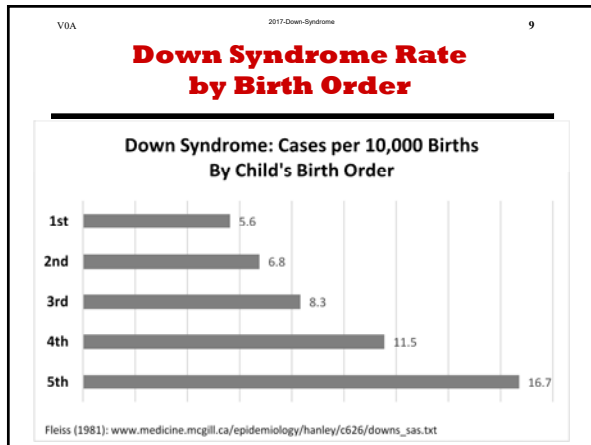
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Average Survival Age and Sex Ratio

Due to advances in medical technology, individuals with Down syndrome are living longer.

- Before antibiotics, average survival age was nine.
- With antibiotics, average survival age was 19.
- With antibiotics and corrective heart surgery, 80% of adults with Down syndrome reach age 60.

Among infants with Down syndrome, males are 24% more prevalent than females. Among moms 20-24, the male-female sex ratio is 1.73. The sex-ratio decreases as the age of the mother increases.



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Down Syndrome Rates: Combine into Two Groups

Combine birth orders into two groups.
Combine mom's ages into two groups.

Conceptually simpler.
Facilitates simple arithmetic comparisons.
Check conditions for Simpson's paradox

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Down Syndrome Rate by Birth Order and Mom's Age

Mom's Age	Child's Birth Order		
	1st-3rd	4th-5th	Total
15-34	5.3	6.0	5.4
35-50	35.1	40.6	38.7
Total	6.8	14.4	9.0

Fleiss (1981): www.medicine.mcgill.ca/epidemiology/hanley/c626/downs_sas.txt

Later children are twice as likely to have Down syndrome as [are] earlier children.
Older moms are seven times as likely to have Down syndrome child as [are] younger moms.

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Later children are 112% more likely to have Down syndrome than [are] earlier children.

Among younger moms, later children are 14% more likely to have Down syndrome than earlier children.

Among older moms, later children are 16% more likely to have Down Syndrome than earlier children.

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Down Syndrome Rate: Controlling for Moms Age

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Before controlling for Mom's age, "Later children are 112% more likely to have Down syndrome than earlier children [more than twice as likely as earlier children]."

After controlling for mom's age, "Later children are 14 to 16% more likely to have Down syndrome than earlier children."

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Down Syndrome Cases:

Association between birth order and mom's age.

Mom's Age	Child's Birth Order		
	1st-3rd	4th-5th	Total
15-34	1,008	363	1,371
35-50	368	790	1,158
Total	1,376	1,153	2,529

Earlier children: more likely to have younger moms.
 Later children: more likely to have older moms.

Mom's age confounds influence of birth order on chance of a child having Down syndrome.

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Down Syndrome: Most Common vs. Most Likely

54% of children with Down syndrome are born to women under 35 years of age.

Children with Down syndrome are most *common* for Moms *under* 35 years old.

Children with Down syndrome are most *likely* for Moms *over* 35 years old.

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Conclusion

Being a statistician involves searching for the strongest – the most fundamental – factors that influence an association.

Ignoring stronger factors can lead to Simpson's paradox or simply misunderstanding the relevant statistical associations that might better serve as a basis for identifying causal connections.

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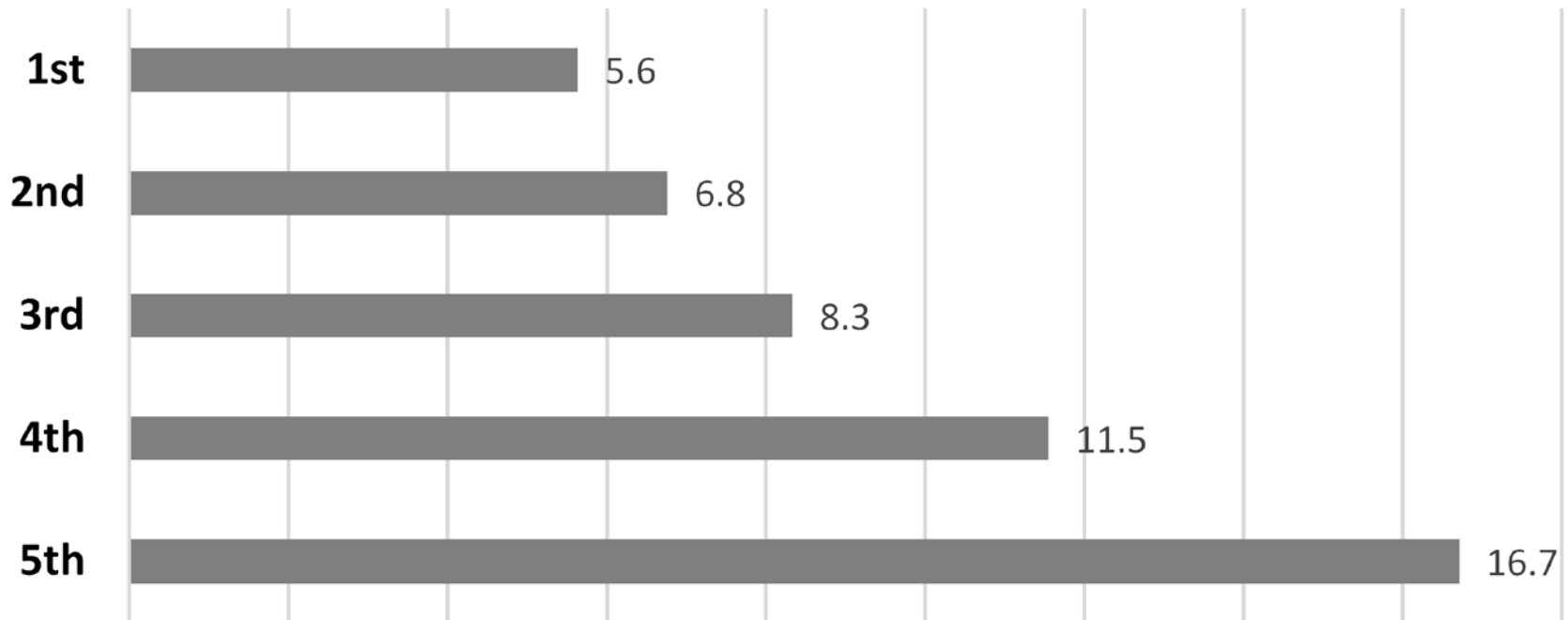
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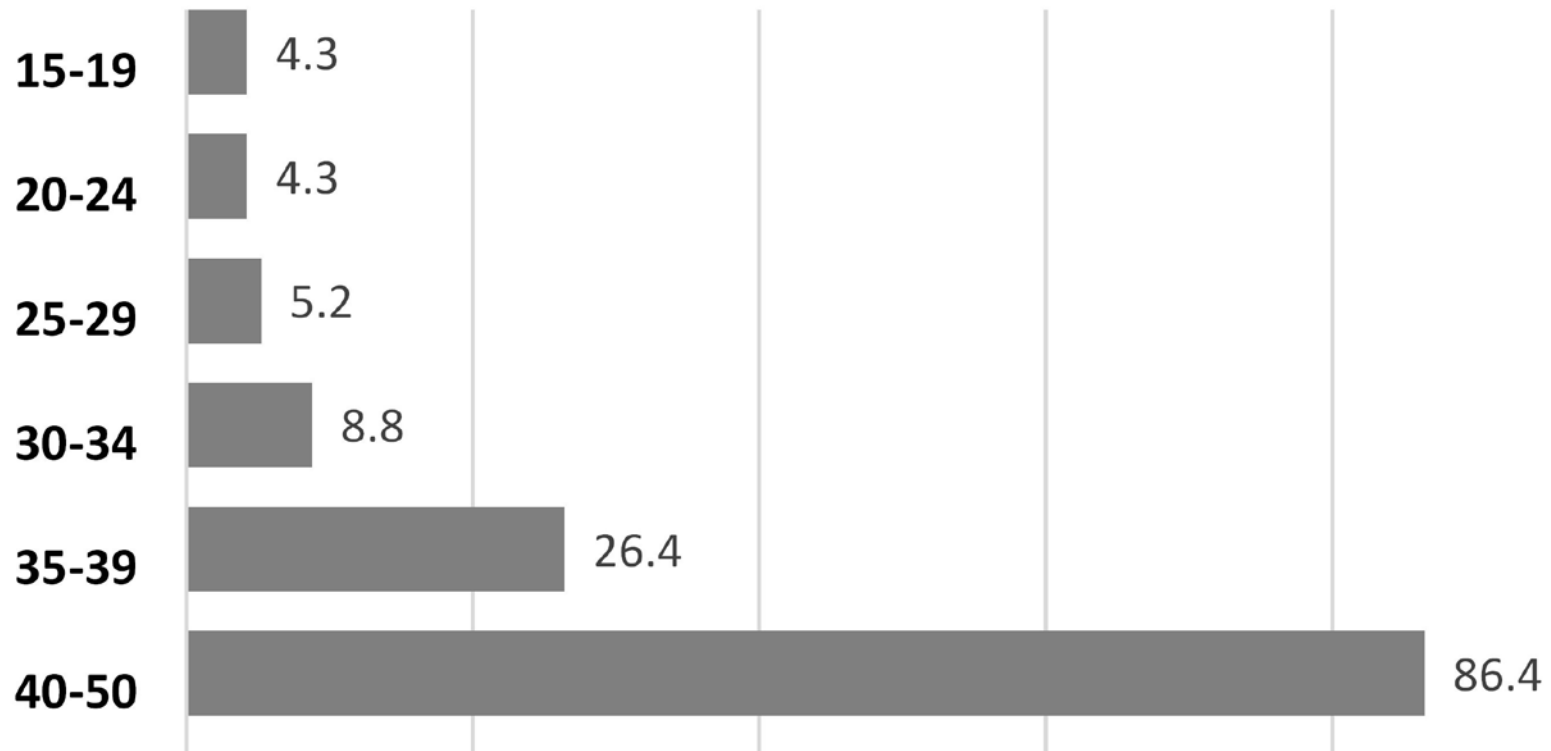
Down Syndrome Rate by Birth Order

Down Syndrome: Cases per 10,000 Births
By Child's Birth Order



Down Syndrome Rate by Mom's Age

Down Syndrome: Cases per 10,000 Births
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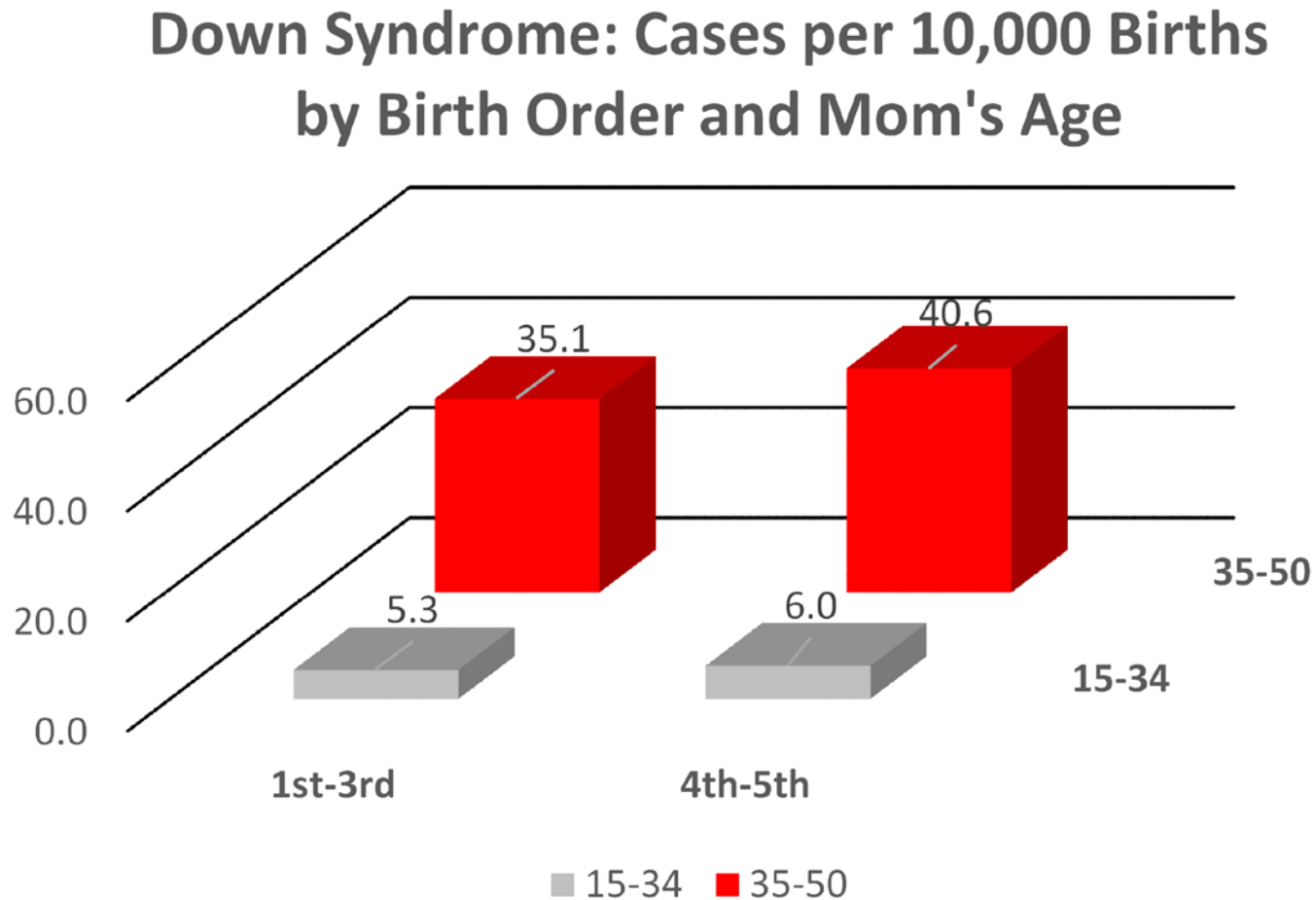
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