



How Often: All-by-All

- OHDSI Global Symposium: proof of concept for large-scale incidence rate generation
- All by all: incidence rates for **every drug, every side effect**
 - About 40,000,000 pairs
 - Plus every side effect (disease prevalence)
 - Stratified



Why All-by-All Incidence?

- Planning – how often does a disease happen
- Side effects – if a drug causes a side effect, how often does it happen
 - Many side effects are well known, but most clinicians have no idea of the incidence
- Detection – compare adverse event reports of new treatment with baseline rates



Why All-by-All Incidence?

- Incidence rate calculation is “simple”
 - Feasible to execute all-by-all
 - Fewer assumptions
 - (But still more complicated than it looks!)
- Characterization = non-causal, but can still be useful
 - If incidence is low and side effect is not serious, then we’re good
 - If incidence is high, then need to look out for it even if not caused by drug



Why All-by-All: Fill Gaps in Evidence

- What currently exists?
 - Prospective studies, RCTs
 - Potentially causal
 - Hard to do at scale (they're not doing 40 million estimates)
 - Small sample size (not rare)
 - Less generalizable
 - Drug package inserts
 - Not causal (may have nothing to do with the drug)
 - Few have rates
 - Guessing



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All-By-All incidence rates attempt to fill in these gaps

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Why All-by-All: Assess reliability of outcomes

- Estimate EHRs and claims measurement error
 - Differences in outcomes between databases
 - One of several factors
 - Differences between RCT or prospective and EHR or claims
 - RCT >> EHR could be lack of coding
 - Averaged across drugs



Caveats to incidence rates

- Why rates might be high:
 - Causal (attributable risk), *or*
 - Indication is a risk (ex: statins reduce risk for MI, but the indication for statins is that they are at high risk for MI)
- 40 million estimates even before stratification
 - 2600 drugs, 18000 SNOMED outcomes
 - Need to ensure rates are not being misinterpreted (i.e., causal) when used



Uncertainty > Accuracy

- The task is not so much better incidence rates but better estimation of uncertainty
 - Don't need to get each of 40 million estimates right
 - Need to get proper uncertainty estimates for them
- And then conveying that uncertainty to readers
- Work on improving the rates in parallel



All-by-All Demo Went Live in 2017



How Often...

How often do patients get a condition after starting a drug?

Which drug are you interested in?

Which condition are you interested in?

What this does

Use this tool to look up the proportion of people taking a drug who are newly diagnosed with a condition within 1 year of starting the drug. You can search for a specific drug-condition incidence by entering your drug and condition of interest in the fields above. Or, you can browse a list of conditions of potential interest by leaving the condition field blank, and you'll be shown conditions listed on the drug's product label.

What this does not do

This tool **does not** demonstrate that a drug causes a condition (i.e., that the condition is a side effect of the drug). Instead, for example, the condition may be part of the reason you are taking the drug, or the condition may just be common in the population.

This tool provides the overall observed risk in a population, but does not provide the attributable risk due to drug exposure. The results provided are raw unadjusted numbers for each diagnosis. The data made available through this site are for informational purposes only and are not a substitute for professional medical advice or services. You should not use this information for comparing drugs or making decisions related to diagnosing or treating a medical or health condition; instead, please consult a physician or healthcare professional in all matters related to your health.



Experience with the All-by-All

- Columbia-NYP emergency department, QA
 - Used by some staff on patients with unexplained symptoms
 - No formal evaluation
- Was the trigger for Anna Ostropolets's Data Consult Service
 - Angioedema with penicillin
- Elise Ruan found that it was reliable for several examples but some exceptions
 - sexual dysfunction and sertraline; muscle pain and atorvastatin
- Did not maintain proof of concept



We need you!

- We have shown proof-of-concept
- Time to produce the all-by-all with stratification
 - Need to determine what strata we can do
- Phenotypes
 - Condition codes, phenotype library
 - New methods in between – research
- How to aggregate the information
- How to communicate (non-causal) incidence rates
- We need your help
 - Will be iterative and will want to keep it up to date