Realities of Disease Forecasting and Analytics: A View from Academia

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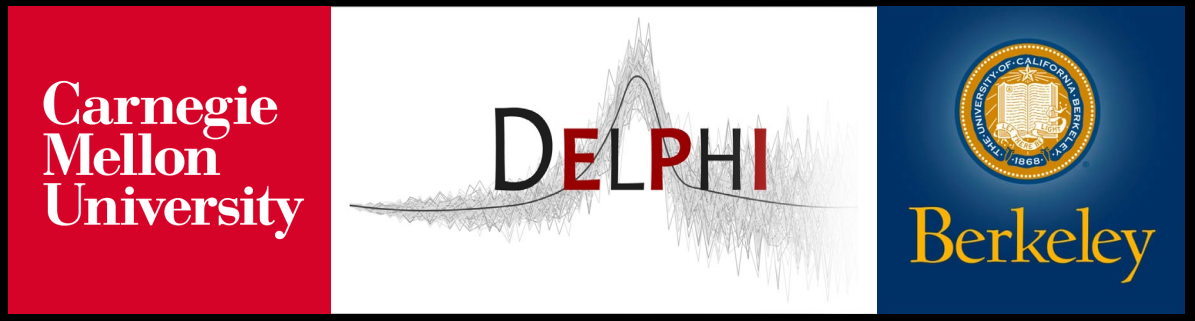

Predicting vs. Forecasting

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- **Predicting**: asserting that a particular event *will* happen
  - e.g. “It *will* rain tomorrow in Portland”
  - will be proven either right or wrong

- **Forecasting**: listing all possible outcomes, and how *likely* each one is
  - e.g. “There is 20% chance of rain tomorrow in Portland” (and 80% chance of no rain)
  - will *not* be proven right or wrong. Instead, it has a *skill* level.

For decision making and policy setting, *forecasting* is more useful than *Predicting*.

Pandemic Lesson #1

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- Before we try to reduce our uncertainty about the *future* via forecasting, we must first reduce our uncertainty about the *present*, via nowcasting (a.k.a situational awareness).
- Situational awareness (nowcasting) is technologically easier to accomplish than forecasting, and is a bigger "bang for the buck".

Forecasting Needs Both Theory and Data

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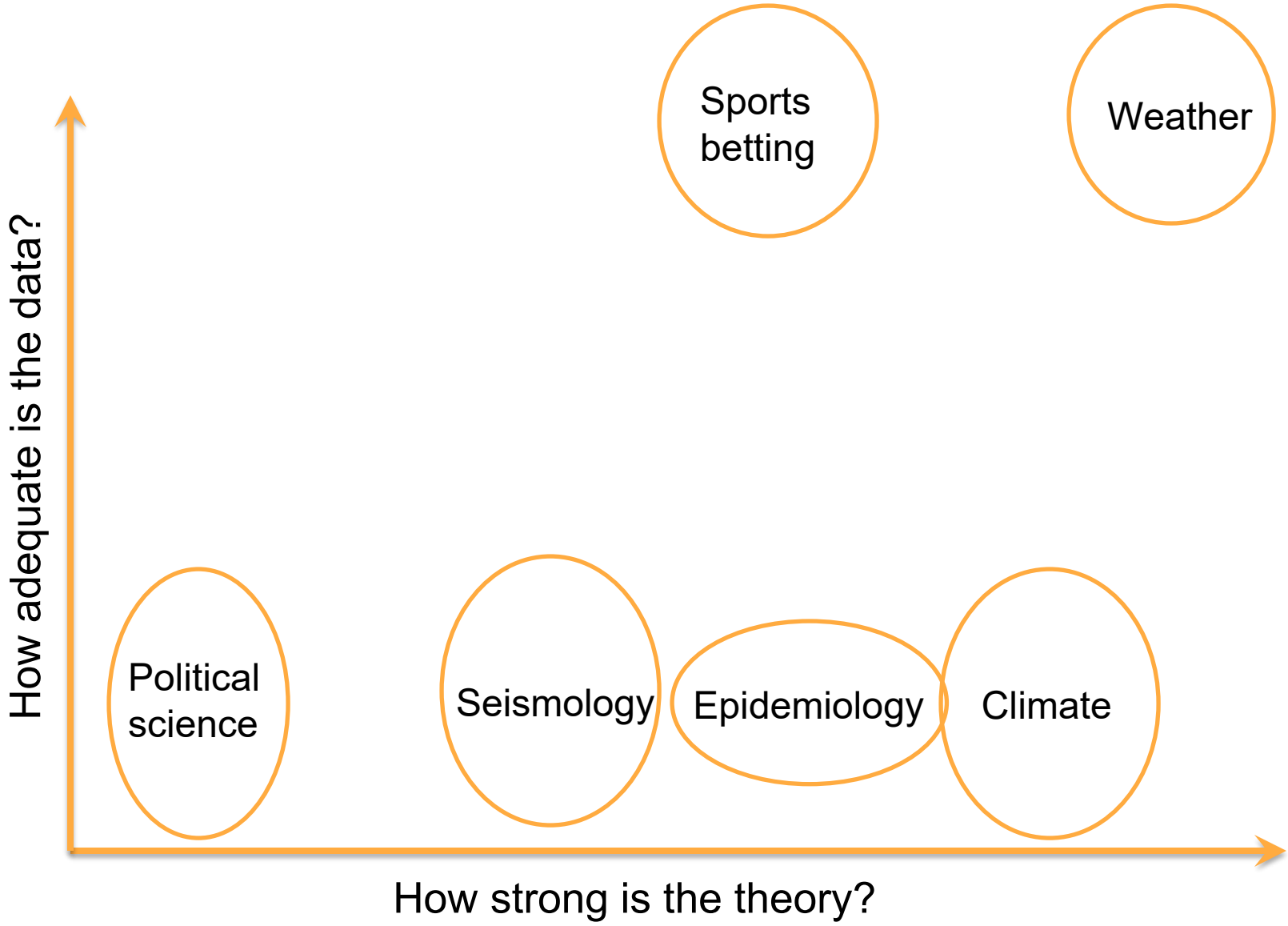

Situational Awareness Across the Severity Pyramid

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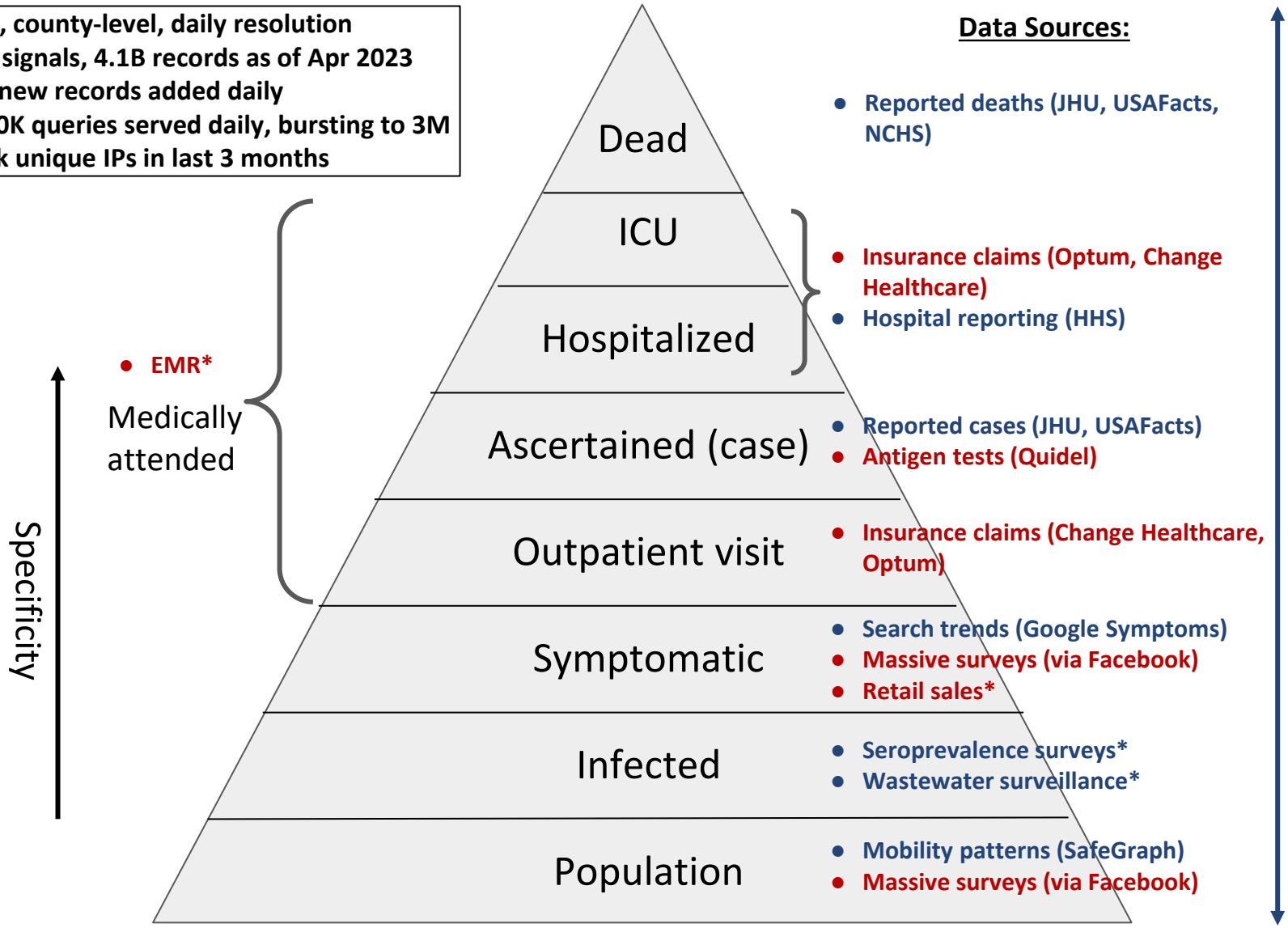
- U.S., county-level, daily resolution
- 511 signals, 4.1B records as of Apr 2023
- 3M new records added daily
- ~100K queries served daily, bursting to 3M
- >50k unique IPs in last 3 months



Data Sources:

- Reported deaths (JHU, USAFacts, NCHS)
- Insurance claims (Optum, Change Healthcare)
- Hospital reporting (HHS)
- EMR*
- Reported cases (JHU, USAFacts)
- Antigen tests (Quidel)
- Insurance claims (Change Healthcare, Optum)
- Search trends (Google Symptoms)
- Massive surveys (via Facebook)
- Retail sales*
- Seroprevalence surveys*
- Wastewater surveillance*
- Mobility patterns (SafeGraph)
- Massive surveys (via Facebook)

Red: Delphi unique sources. Blue: mirroring, versioning, and archiving. *Planned.

Pandemic Lesson #2

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- The only tools that will be useful in an emergency are those that have already been working before it, because:
  - The needs of public health change fast in an emergency
  - There is no time to build relationships
  - There is no time to negotiate legal agreements
  - There is no time to test, iterate and improve

What Will It Take to Get There?

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