2024 OHDSI Global Symposium

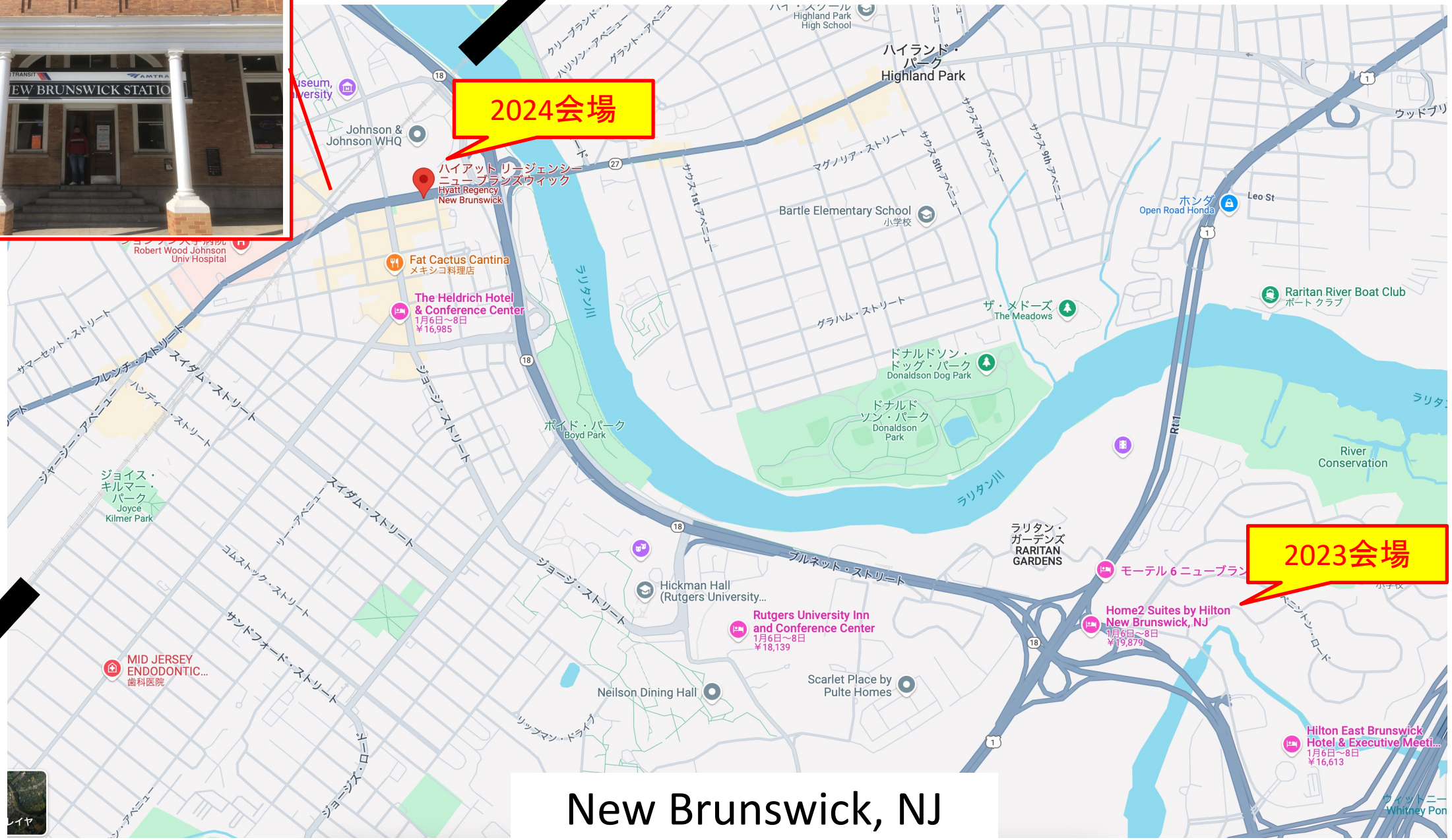
Oct. 22-24

New Brunswick, N.J. · Hyatt Regency Hotel

山下貴範

九州大学

EWR, NY, JFK



DC

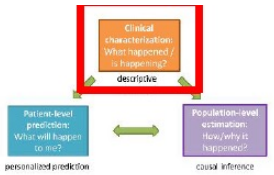
New Brunswick, NJ

10/22 Tutorial
An Introduction to the Journey from Data to Evidence Using OHDSI

https://www.ohdsi.org/ohdsi2024-tutorials/

- 初級編、SNOMEDマッピング
- ATLAS、Rパッケージ
- デモ https://results.ohdsi.org/app/23_TutorialDemo2024
- The LEGEND (Large-scale Evidence Generation and Evaluation across a Network of Databases)
- LEGEND Basic Viewer https://results.ohdsi.org/app/02_LegendBasicViewer

Case study: treatment pathways



COLLOQUIUM PAPER

PNAS

CrossMark click for updates

Characterizing treatment pathways at scale using the OHDSI network

George Hripcsak[a,b,c,1], Patrick B. Ryan[c,d], Jon D. Duke[c,e], Nigam H. Shah[c,f], Rae Woong Park[c,g], Vojtech Huser[c,h], Marc A. Suchard[c,i,j,k], Martijn J. Schuemie[c,d], Frank J. DeFalco[c,d], Adler Perotte[a,c], Juan M. Banda[c,f], Christian G. Reich[c,l], Lisa M. Schilling[c,m], Michael E. Matheny[c,n,o], Daniella Meeker[c,p,q], Nicole Pratt[c,r], and David Madigan[c,s]

[a]Department of Biomedical Informatics, Columbia University Medical Center, New York, NY 10032; [b]Medical Informatics Services, NewYork-Presbyterian Hospital, New York, NY 10032; [c]Observational Health Data Sciences and Informatics, New York, NY 10032; [d]Epidemiology Analytics, Janssen Research and Development, Titusville, NJ 08560; [e]Center for Biomedical Informatics, Regenstrief Institute, Indianapolis, IN 46205; [f]Center for Biomedical Informatics Research, Stanford University, CA 94305; [g]Department of Biomedical Informatics, Ajou University School of Medicine, Suwon, South Korea, 443-380; [h]Lister Hill National Center for Biomedical Communications (National Library of Medicine), National Institutes of Health, Bethesda, MD 20894; [i]Department of Biomathematics, University of California, Los Angeles, CA 90095; [j]Department of Biostatistics, University of California, Los Angeles, CA 90095; [k]Department of Human Genetics, University of California, Los Angeles, CA 90095; [l]Real World Evidence Solutions, IMS Health, Burlington, MA 01809; [m]Department of Medicine, University of Colorado School of Medicine, Aurora, CO 80045; [n]Department of Biomedical Informatics, Vanderbilt University Medical Center, Nashville, TN 37212; [o]Geriatric Research, Education and Clinical Center, VA Tennessee Valley Healthcare System, Nashville, TN 37212; [p]Department of Preventive Medicine, University of Southern California, Los Angeles, CA 90089; [q]Department of Pediatrics, University of Southern California, Los Angeles, CA 90089; [r]Division of Health Sciences, University of South Australia, Adelaide, SA, Australia 5001; and [s]Department of Statistics, Columbia University, New York, NY 10027

Edited by Richard M. Shiffrin, Indiana University, Bloomington, IN, and approved April 5, 2016 (received for review June 14, 2015)

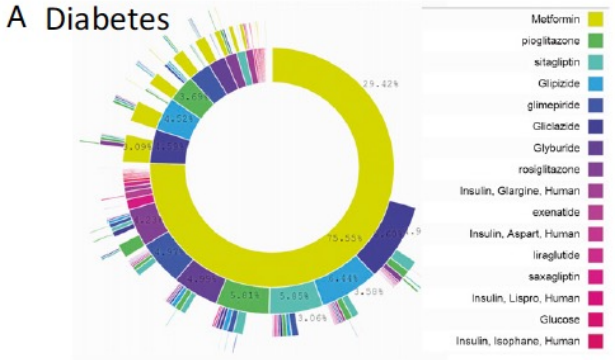
- Characterizing treatment pathways for type 2 diabetes mellitus, **hypertension** & depression
- Using 11 databases from 4 countries, covering > 250M patients

2 型糖尿病、高血圧、うつ病の治療経路が解明

治療経路により、世界は時間の経過とともに病気や場所を問わずより一貫した治療へと移行していることが明らかになったが、ソース間では依然として大きな異質性が残っており、臨床試験の結果を一般化する上での課題が指摘。

糖尿病では、高血圧やうつ病に比べて、第一選択薬であるメトホルミンがはるかに有効。

Treatment pathways for hypertension



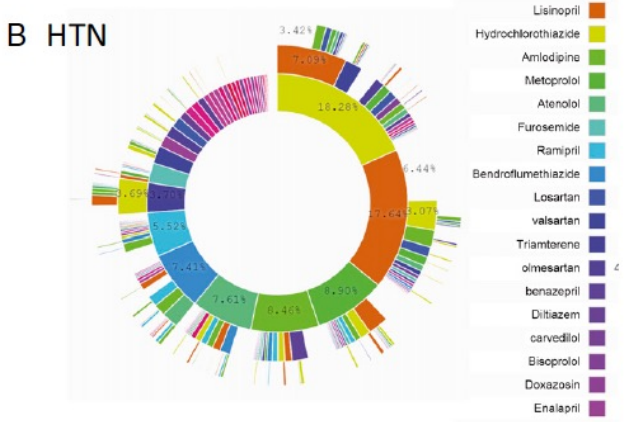
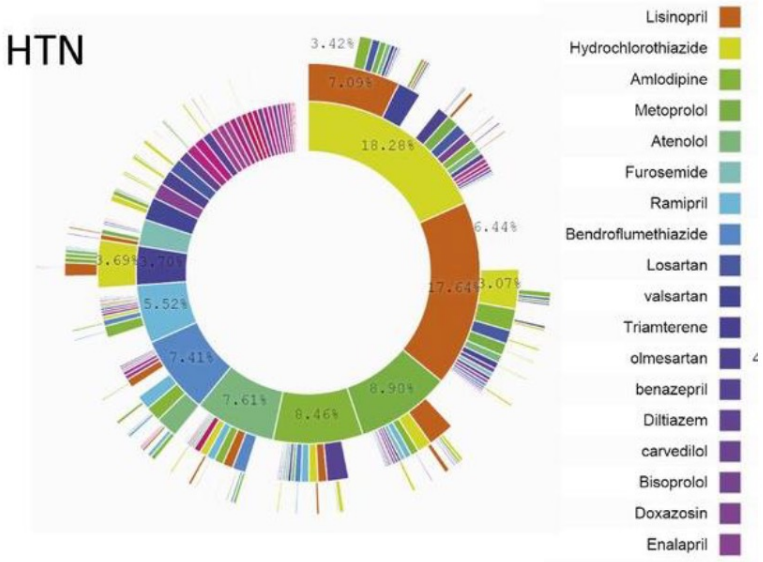


Fig. 2. Treatment pathways for all data sources. For each disease, diabetes (*A*), hypertension (*B*), and depression (*C*), and across all data sources, the inner circle shows the first relevant medication that the patient took, the second circle shows the second medication, and so forth. Only four levels are shown, but up to 20 medications were recorded. For example, 76% of diabetes patients started with metformin, and 29% took only metformin.



- **hydrochlorothiazide** predominant as starting medication (18.28%), but often paired with other another active ingredient as combo
- **lisinopril** more significantly predominant (6.44%) as sole therapy

Characterization gives us the full picture of what has happened and is happening, providing a rich, comprehensive knowledge base about healthcare practices, patterns and trends.

So What?

Is LEGEND-like large-scale evidence reliable?

Journal of the American Medical Informatics Association, 27(8), 2020, 1268–1277
doi: 10.1093/jamia/ocaa124
Research and Applications

Research and Applications

Large-scale evidence generation and evaluation across a network of databases (LEGEND): assessing validity using hypertension as a case study

Martijn J Schuemie,[1,2] Patrick B Ryan,[1,3] Nicole Pratt,[4] RuiJun Chen,[3,5] Seng Chan You,[6] Harlan M Krumholz,[7] David Madigan,[8] George Hripcsak,[3,9] and Marc A Suchard[2,10]

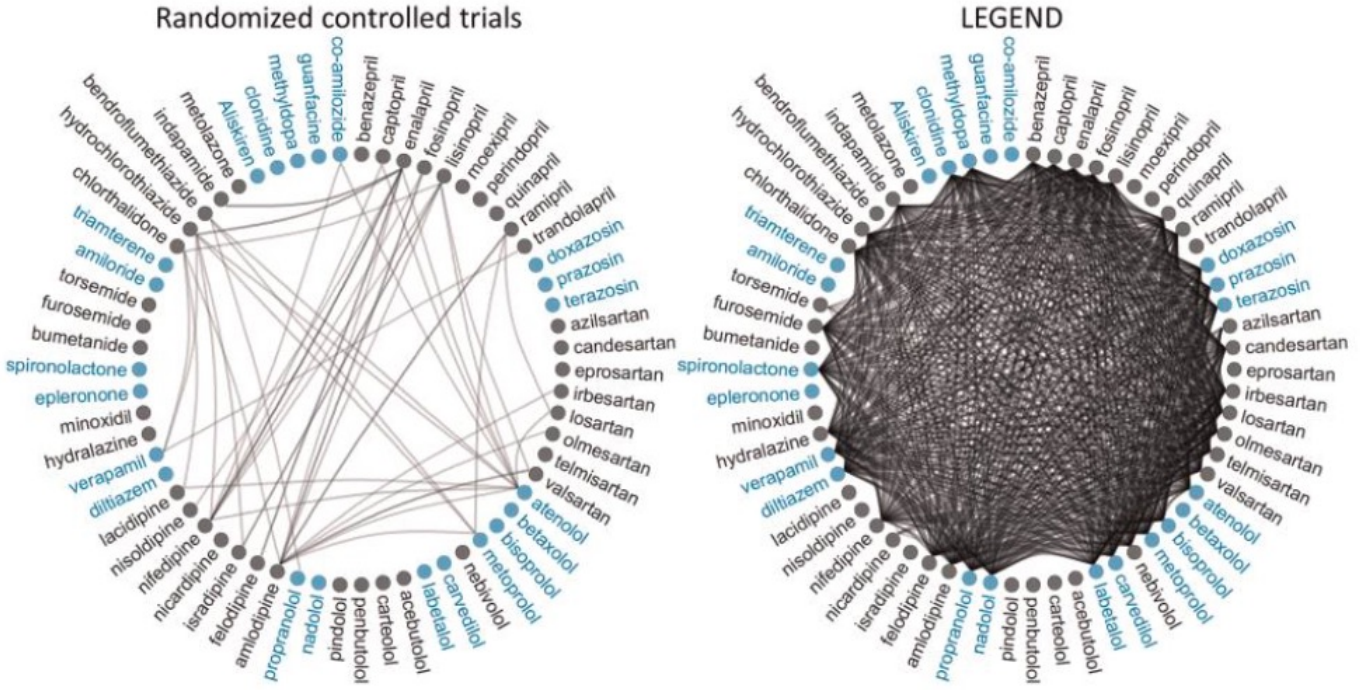
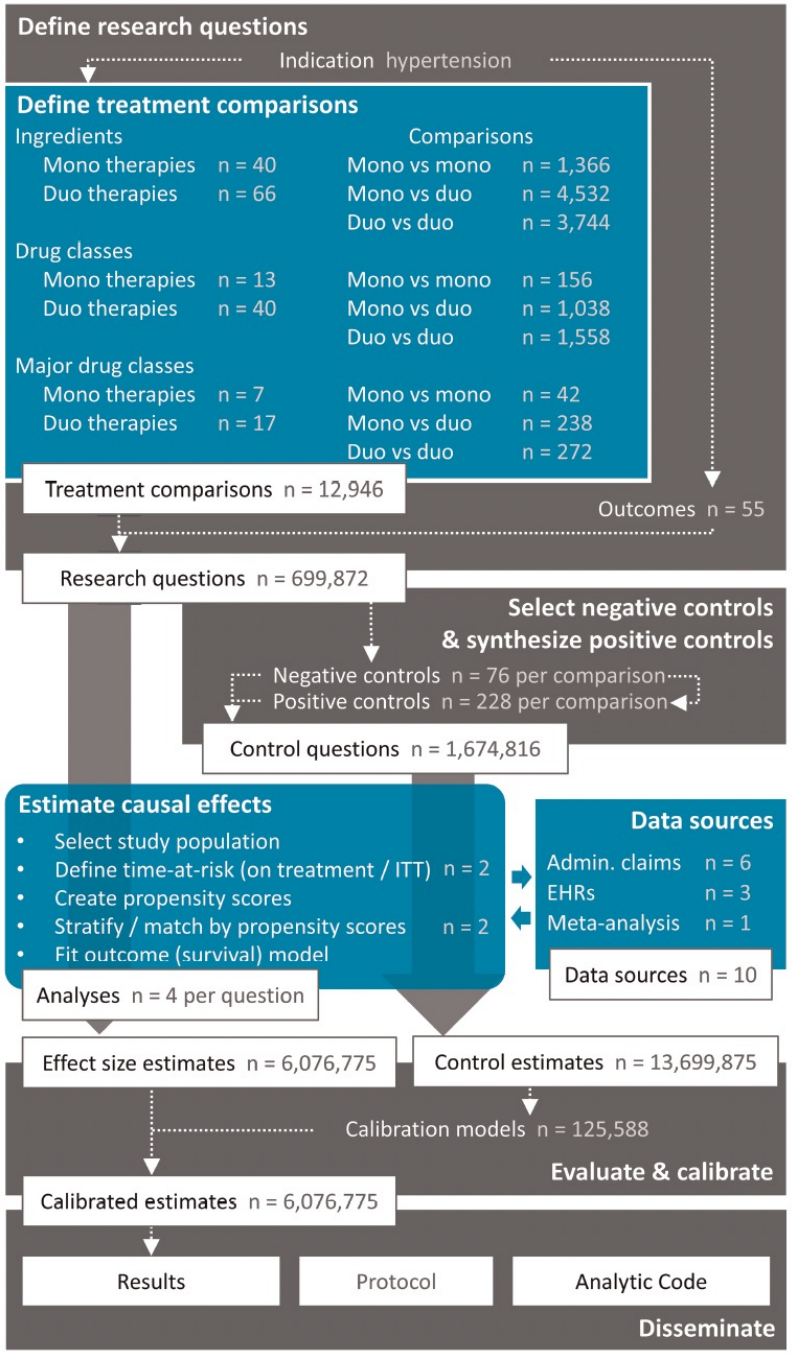
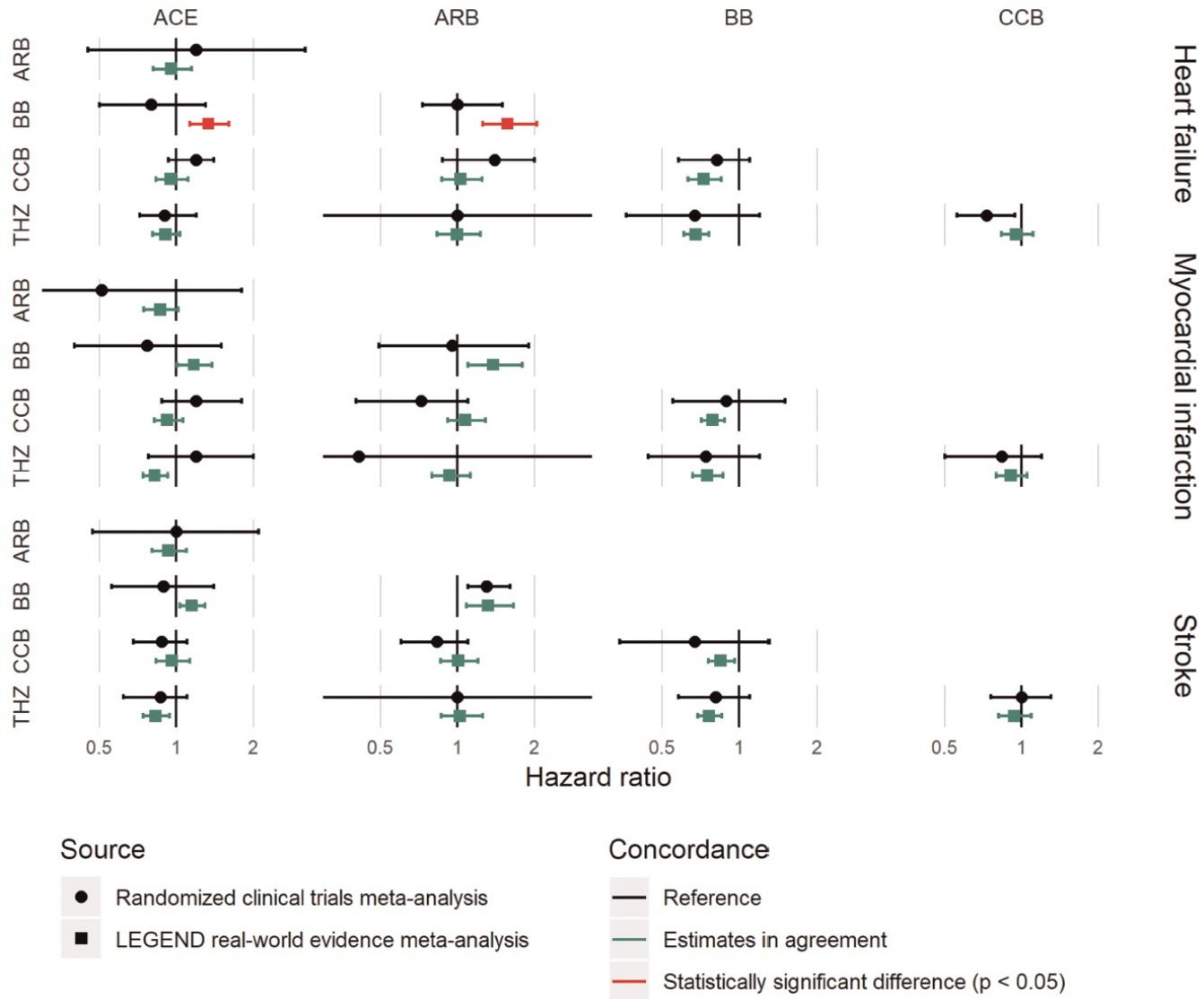


Figure 3. Comparisons of single-drug hypertension treatments in randomized controlled trials (left) and in LEGEND (right). Each circle represents an ingredient. Color groupings indicate drug classes. A line between circles indicates the 2 drugs are compared in at least 1 study.


Define research questions
Indication hypertension
Define treatment comparisons
Ingredients
Comparisons
Mono therapies n = 40
Mono vs mono n = 1,366
Duo therapies n = 66
Mono vs duo n = 4,532
Duo vs duo n = 3,744
Drug classes
Mono therapies n = 13
Mono vs mono n = 156
Duo therapies n = 40
Mono vs duo n = 1,038
Duo vs duo n = 1,558
Major drug classes
Mono therapies n = 7
Mono vs mono n = 42
Duo therapies n = 17
Mono vs duo n = 238
Duo vs duo n = 272
Treatment comparisons n = 12,946
Outcomes n = 55
Research questions n = 699,872
Select negative controls & synthesize positive controls
Negative controls n = 76 per comparison
Positive controls n = 228 per comparison
Control questions n = 1,674,816
Estimate causal effects
Select study population
Define time-at-risk (on treatment / ITT) n = 2
Create propensity scores
Stratify / match by propensity scores n = 2
Fit outcome (survival) model
Data sources
Admin. claims n = 6
EHRs n = 3
Meta-analysis n = 1
Data sources n = 10
Analyses n = 4 per question
Effect size estimates n = 6,076,775
Control estimates n = 13,699,875
Calibration models n = 125,588
Evaluate & calibrate
Calibrated estimates n = 6,076,775
Results
Protocol
Analytic Code
Disseminate


ACE
ARB
BB
CCB
ARB
BB
CCB
THZ
Heart failure
Myocardial infarction
Stroke
0.5
1
2
Hazard ratio
Source
Randomized clinical trials meta-analysis
LEGEND real-world evidence meta-analysis
Concordance
Reference
Estimates in agreement
Statistically significant difference (p < 0.05)

A mantra…

The NEW ENGLAND JOURNAL of MEDICINE

SPECIALTIES TOPICS MULTIMEDIA CURRENT ISSUE LEARNING/CME AUTHOR CENTER PUBLICATIONS

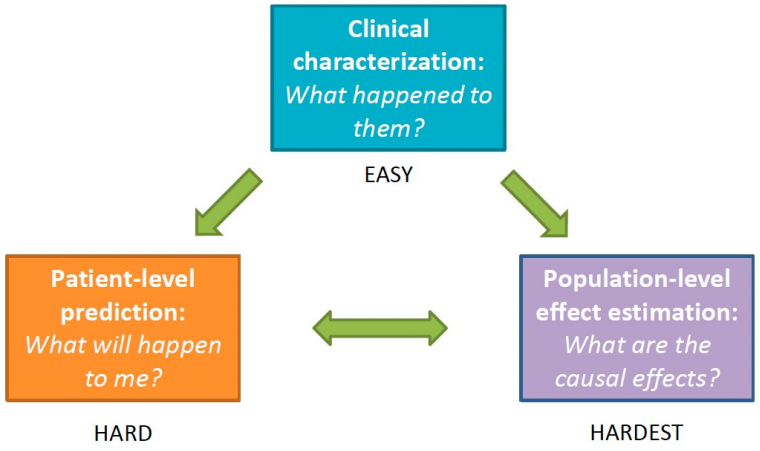
SOUNDING BOARD

The Magic of Randomization versus the Myth of Real-World Evidence

Authors: Rory Collins, F.R.S., Louise Bowman, M.D., F.R.C.P., Martin Landray, Ph.D., F.R.C.P., and Richard Peto, F.R.S. Author Info & Affiliations

Published February 12, 2020 | N Engl J Med 2020;382:674-678 | DOI: 10.1056/NEJMsb1901642 | VOL. 382 NO. 7

But RWE is more than 'causal' evidence



Research

17 Feb 2020

JAMA Internal Medicine | Original Investigation

Comparison of Cardiovascular and Safety Outcomes of Chlorthalidone vs Hydrochlorothiazide to Treat Hypertension

George Hripcsak, MD, MS; Marc A. Suchard, MD, PhD; Steven Shea, MD; RuiJun Chen, MD; Seng Chan You, MD; Nicole Pratt, PhD; David Madigan, PhD; Harlan M. Krumholz, MD, SM; Patrick B. Ryan, PhD; Martijn J. Schuemie, PhD

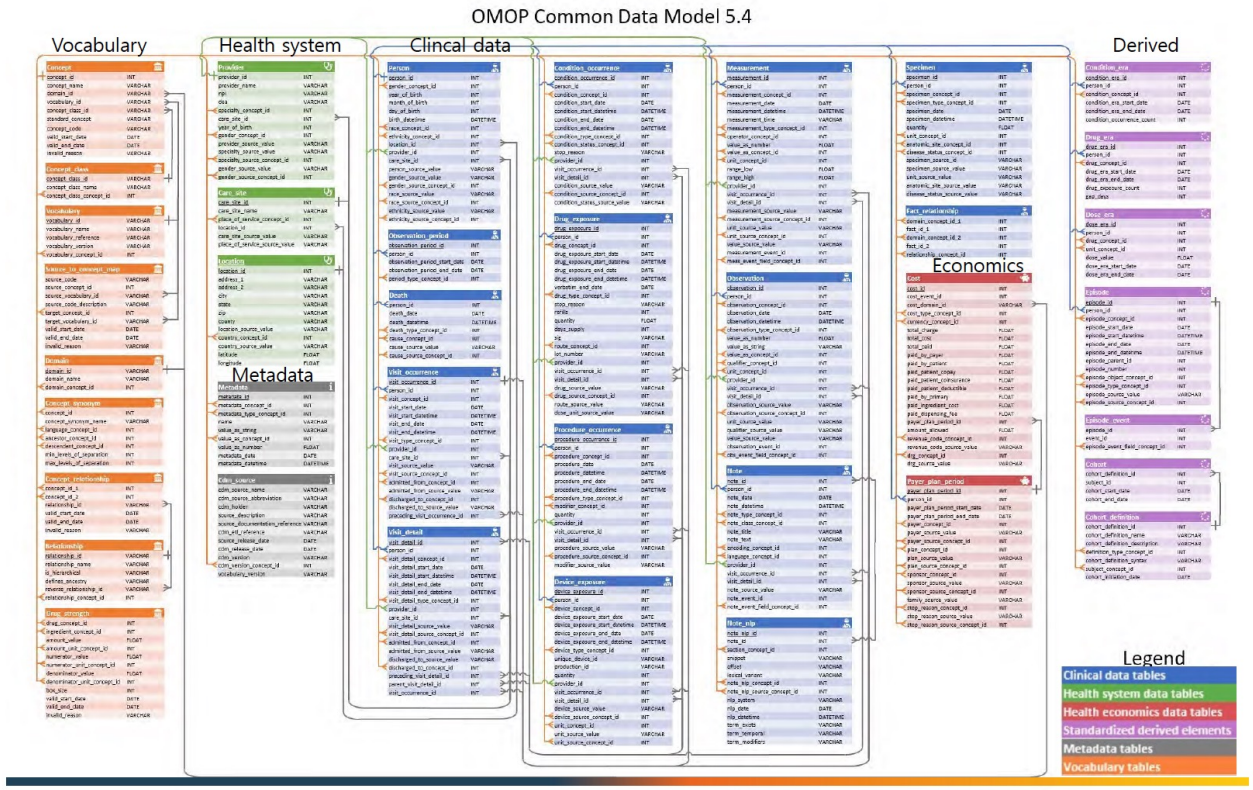
IMPORTANCE Chlorthalidone is currently recommended as the preferred thiazide diuretic to treat hypertension, but no trials have directly compared risks and benefits.

OBJECTIVE To compare the effectiveness and safety of chlorthalidone and hydrochlorothiazide as first-line therapies for hypertension in real-world practice.

DESIGN, SETTING, AND PARTICIPANTS This is a Large-Scale Evidence Generation and Evaluation in a Network of Databases (LEGEND) observational comparative cohort study with large-scale propensity score stratification and negative-control and synthetic positive-control calibration on databases spanning January 2001 through December 2018. Outpatient and inpatient care episodes of first-time users of antihypertensive monotherapy in the United States based on 2 administrative claims databases and 1 collection of electronic health records were analyzed. Analysis began June 2018.

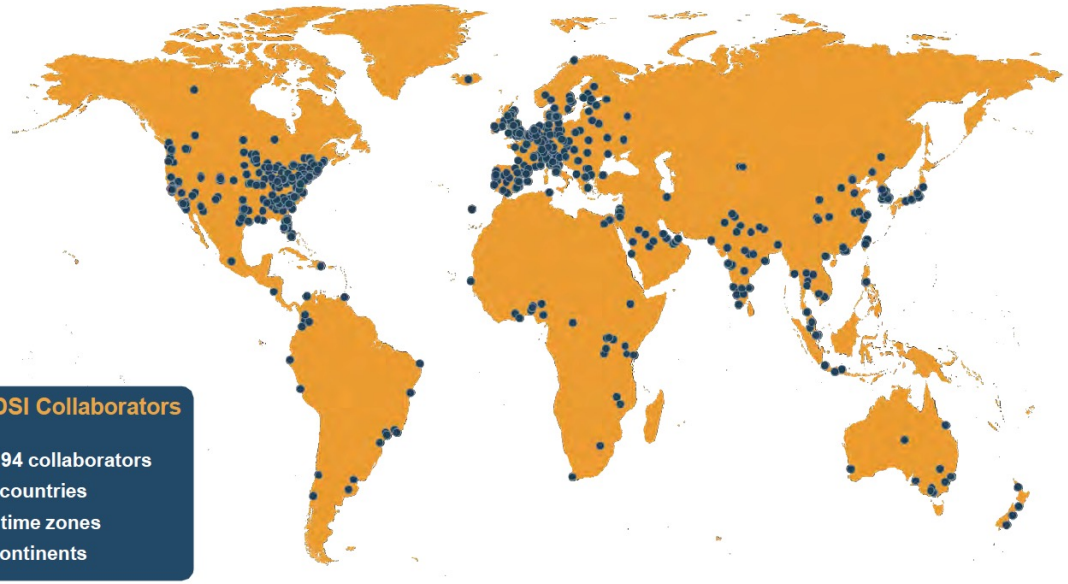
Supplemental content

※LEGENDの活用事例



Source: OHDSI 2024, NJ, USA

OHDSI collaborators



OHDSI Collaborators

- 4,294 collaborators
- 83 countries
- 21 time zones
- 6 continents

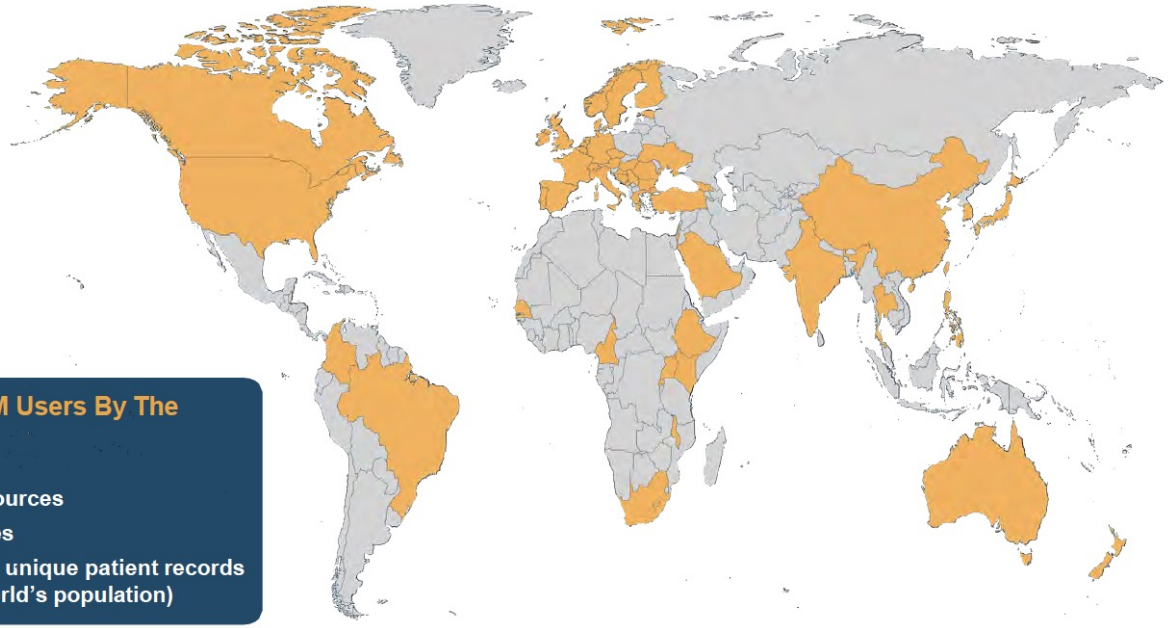
Source: OHDSI 2024, NJ, USA

OHDSI By The Numbers

- 3,758 collaborators
- 83 countries
- 21 time zones
- 6 continents
- 1 community

※参考 2023 Report

OMOP Common Data Model adoption



OMOP CDM Users By The Numbers

- **544 data sources**
- **54 countries**
- **974 million unique patient records (12% of world's population)**

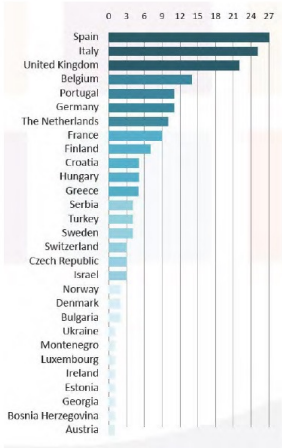
Source: OHDSI 2024, NJ, USA

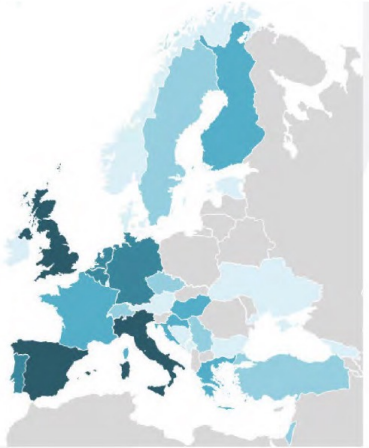
※参考 2023 Report

534 data source
49 countries
956 millions

EHDEN's Journey to Build Europe's Largest Data Network

187 data partners selected among 563 applications
29 countries
>366m person records
1 Common Data Model





efpia

Source: OHDSI 2024, NJ, USA

ポスター

https://ohdsi.org/2024-collaborator-showcase/

- データ標準化、OMOP構築、基盤構築が多い
- 次に、データ解析関連か
- Ajou univ. １０個ぐらい？
- シンガポール、標準コードマッピング、政府支援
- 今回、フィリピン、インドなど新しいアジアからのプレゼンは、、、、
- ソフトウェアデモは少々、閑散


OHDSI
Observational Health Data Sciences and Informatics
#JoinTheJourney