Provider-Level
Variation and Determinants of Outpatient Generic Prescribing in a Mixed-Payer Healthcare System

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Disclosures

- Funding:

Background

- Generic drugs provide savings to both patients and payers
  - In the U.S., $1.7 T saved between 2004 and 2015[1]

- In 2015, 88% of prescriptions were dispensed generically[1]
  - Yet generic use is not uniform across all therapeutic classes and products[2]

- Poor generic use can be due to:
  - Lack of generic equivalents (brand only)
  - Patient or provider experiences or perceptions of generic drug quality, safety, and effectiveness

1. Generic Pharmaceutical Association. Generic Drug Savings in the U.S. 7th Edition. 2015
2. Segal et al., Therapeutic class differences in generic usage. *Pharmacoepidemiol Drug Saf*. 2015; 24:1-587. [ABSTRACT, International Society for Pharmacoepidemiology, Boston 2015]

Study Objectives

- Entered into a cooperative agreement with the U.S. FDA to:
  - Evaluate the effect of generic drug use by therapeutic class
  - Identify determinants of generic utilization

- At PAMFRI, use EHR data from a healthcare delivery system to:
  - Examine physicians' prescribing patterns across various therapeutic classes in the outpatient setting
  - Identify *measurable* and *unexplained* variation in generic prescribing

Study Setting

- Sutter Health
  - Large multi-specialty healthcare delivery system in Northern California

  - Mixed-payer environment, no single formulary

  - Ideal setting to study the natural variation in prescribing patterns in an outpatient clinical-practice setting

Study Design

- Retrospective, cross-sectional analysis of EHR data in 2013

- Eligibility Criteria:
  - Active electronic prescription for a product within at least one of the therapeutic classes of interest
  - At least 18 years of age and EHR activity >12 months prior to the date of the prescription
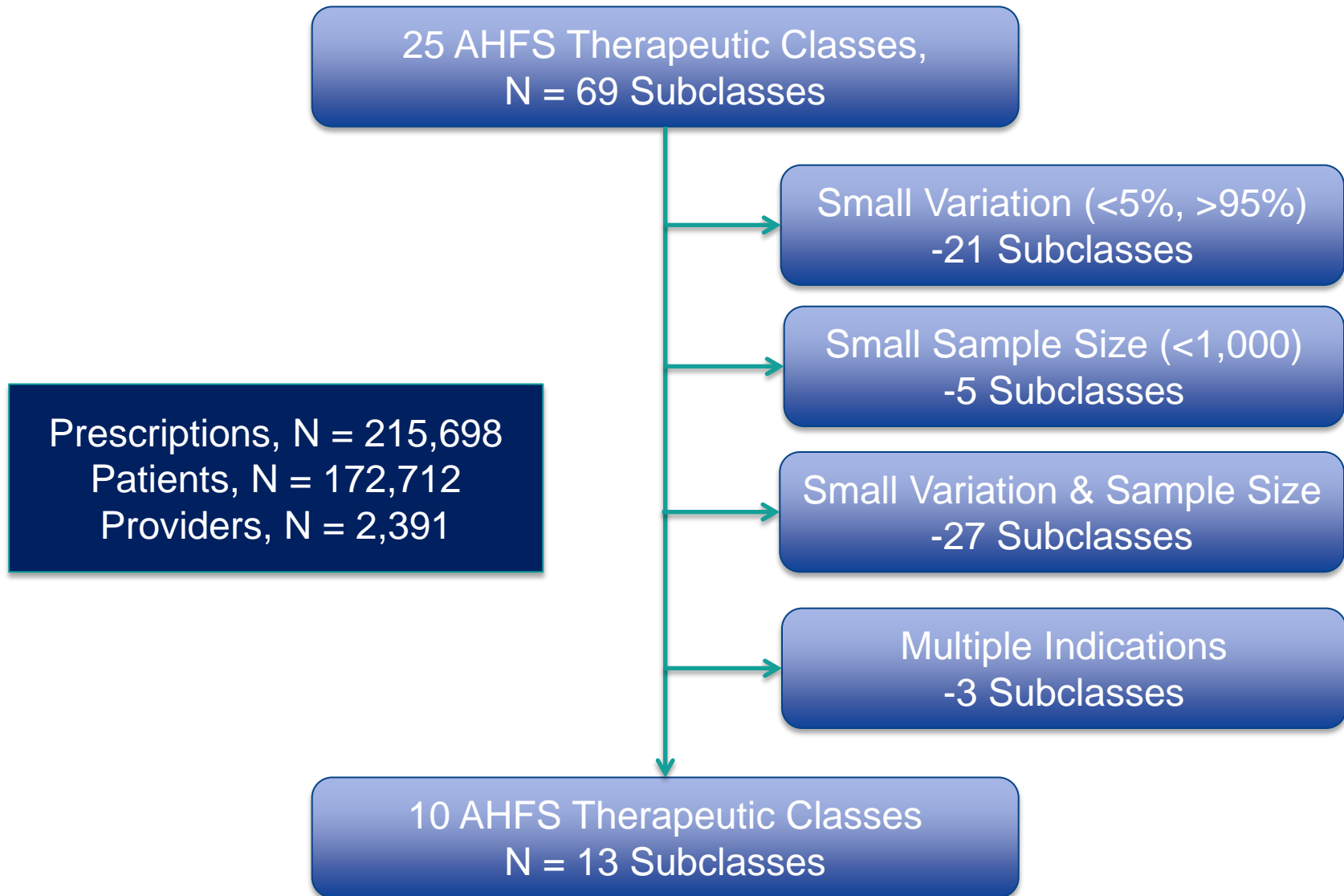
Methods

- Identified 25 American Hospital Formulary System therapeutic classes with the *potential* for poor generic uptake (e.g., drugs with narrow therapeutic index)

- Identified subclasses with products that are *theoretically* interchangeable

- Calculated generic prescribing rates by subclass

- For subclasses with sufficient variation in generic prescribing, performed random-effects logistic regressions:
  - Random intercept for healthcare provider
  - Dependent variable: generic prescribed (No/Yes)
  - Independent variables:
    - Patient-level factors (e.g., age, sex, race, insurance, product was an incident drug)
    - Provider-level factors

Provider-Level Factors

- **Main Variables of Interest**
  - **Type of Provider**
    - Primary Care (reference)
    - Specialty
    - Urgent Care

  - **Product "Experience":** average # of Rx's for products within the therapeutic subclass per week over the last 3 months
    - 0 (reference)
    - 1-5
    - 6-10
    - >10

- Also adjusted for **Patient Volume:** average # of patient encounters per week over the last 3 months

Therapeutic Class/Subclass Selection

25 AHFS Therapeutic Classes,
N = 69 Subclasses

Small Variation (<5%, >95%)
-21 Subclasses

Small Sample Size (<1,000)
-5 Subclasses

Prescriptions, N = 215,698
Patients, N = 172,712
Providers, N = 2,391

Small Variation & Sample Size
-27 Subclasses

Multiple Indications
-3 Subclasses

10 AHFS Therapeutic Classes
N = 13 Subclasses

Example of Therapeutic Subclass Selection

Anti-Depressants	% Generic	N
Alpha-2 Antagonist	100	4,007
DNRI	99.1	19,559
MOI	99.1	108
MOI_SRI/Antagonist	99.8	13,471
SNRI	48.4	20,823
SSRI	99.1	82,250
Tetracyclic	100	17
Tricyclic	100	16,088
OVERALL		

| SNRI	% Generic	N
Desvenlafaxine, Tab, SR	0	1,195
Duloxetine, Cap, DR	1.7	9,615
Venlafaxine, Cap, SR	98.7	7,716
Venlafaxine, Tab	100	2,104
Venlafaxine, Tab, SR	100	193

Therapeutic Subclasses for Statistical Models

| SUBCLASS (products)	INDICATIONS
Androgen Agents (testosterone, methyltestosterone)	Androgen Hypogonadism
Anticonvusants, Hydantoin Derivatives (phenytoin)	Seizures
Angiotensin II Blockers Combination Agents (e.g., -sartans + hydrochlorothiazide)	Hypertension
Angiotensin II Blockers Monotherapy (e.g., -sartans)	Hypertension
Antiarrythmic Agents, Class III (amiodarone, dofetilide, dronefarone)	Heart arrhythmia
Estrogens & combinations (e,g, estradiol, conjugated estrogens)	Menopause
SNRIs (desvenlafaxin, duloxetine, venlafaxine)	Depression/Anxiety
Atypical Anti-Psychotics, 2nd Generation (e.g., clozapine, risperidone)	Schizophrenia
Amphetamine Stimulants (e.g., dexmethlyphenidate, methylphenidate)	ADHD
Short-Acting Beta-Agonists (albuterol sulfate, levobuterol)	Asthma/COPD
Anticholinergic, Beta-2 Agonists (ipratropium-albuterol)	COPD
T4 Thyroid Agent (levothyroxine)	Hypothyroidism
Selective Serotonin Agonists (eg., -triptans)	Migraines

Generic Prescribing Rates by Therapeutic Subclass

Bar chart of Generic Prescribing, % by therapeutic subclass:

- Amphetamine Stimulants: 89.5
- Androgen Agents: 43.9
- Angiotensin II Blockers: Combination: 83.9
- Angiotensin II Blockers: Monotherapy: 68.9
- Antiarrhythmic Agents, Class III: 76.5
- Anticholingergic, Beta-2 Agonists: 31.9
- Anticonvulsant, Hydantoin: 83.5
- Atypical Anti-Psychotic, 2nd Generation: 92.3
- Estrogens & Combinations: 50.9
- Selective Serotonin Agonists: 87.0
- Short-Acting Beta-Agonists: 21.6
- SNRI: 48.4
- T4 Thyroid Agents: 70.9
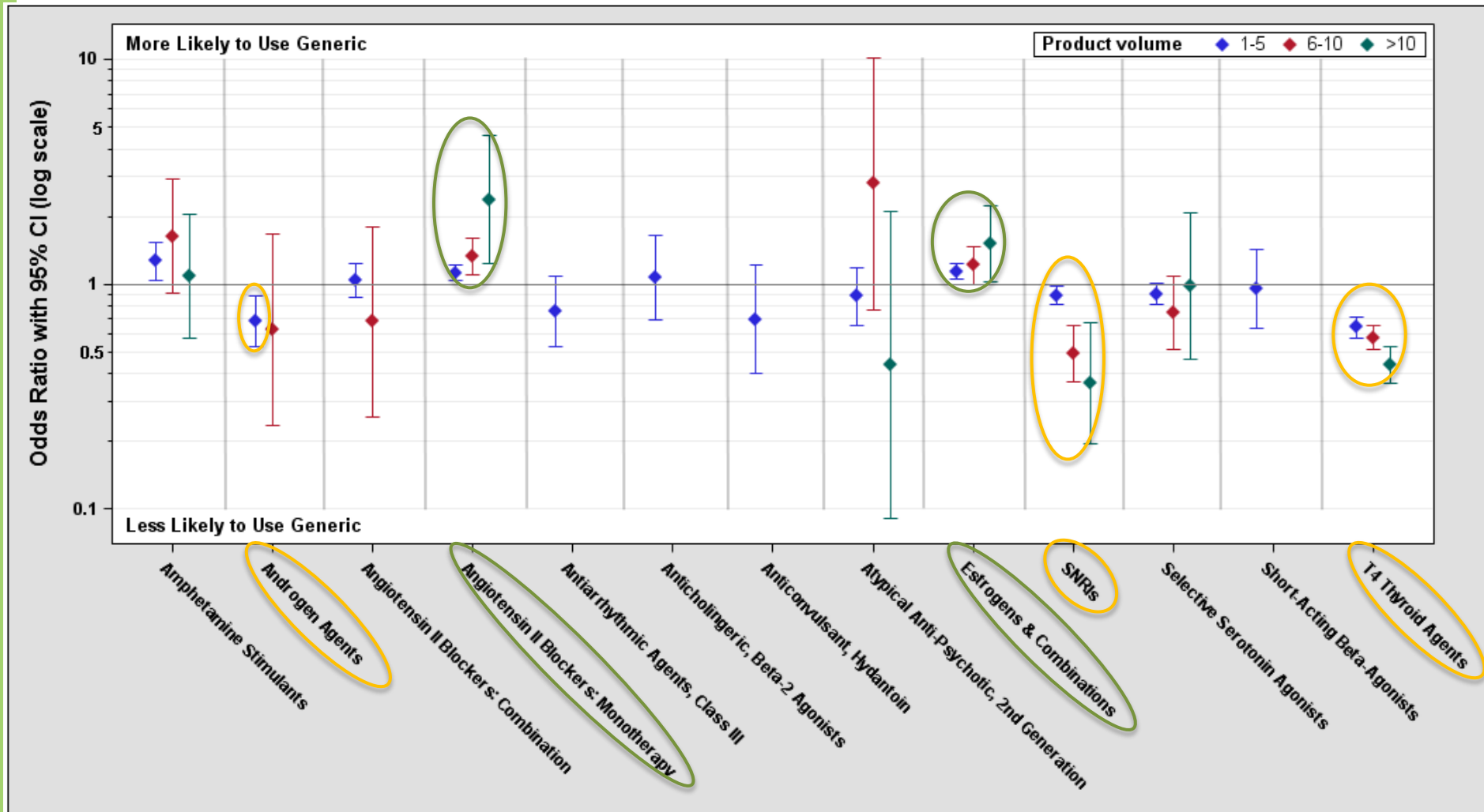
Generic Prescribing, %

Unexplained Between-Provider Variation in Generic Prescribing by Subclass
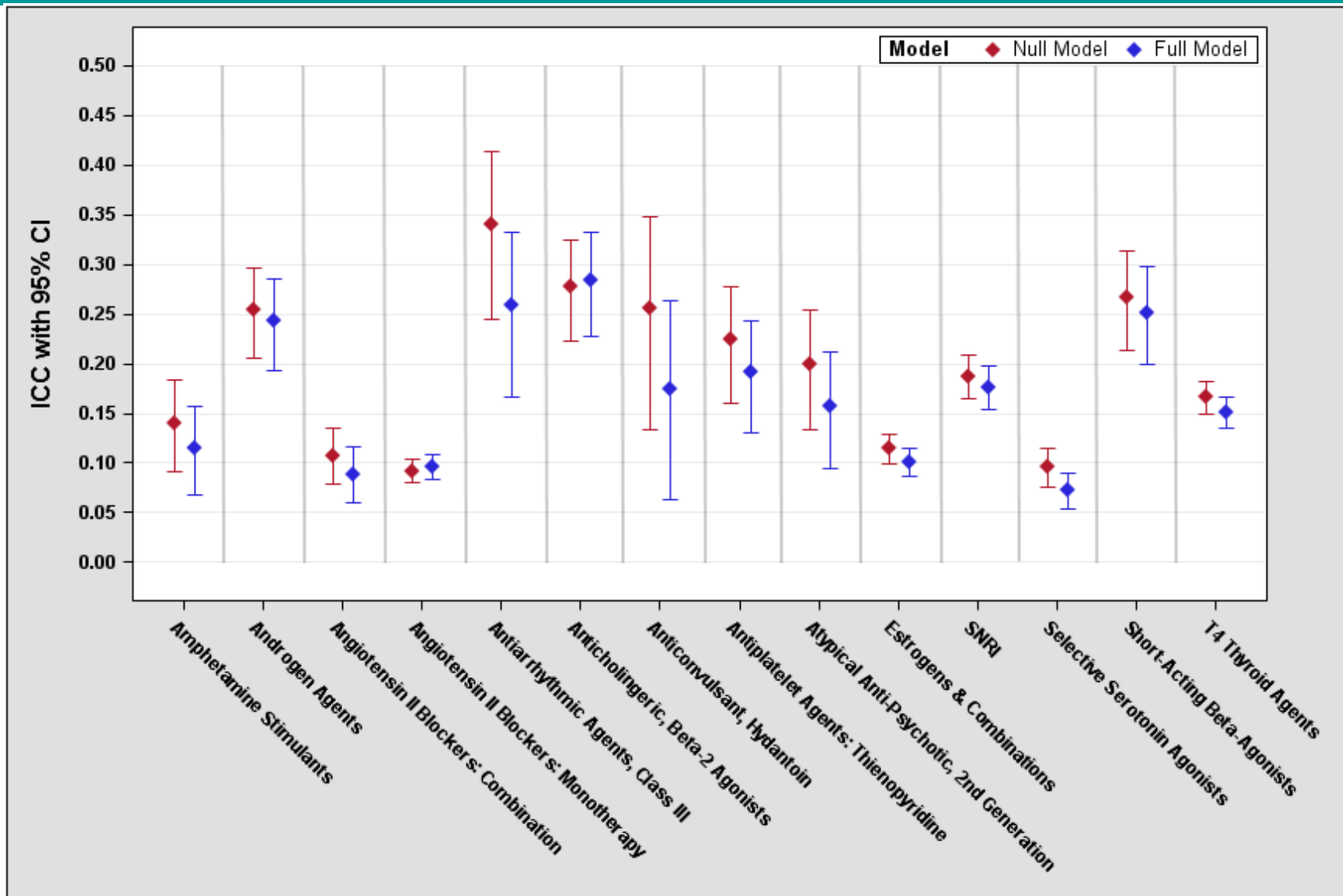
Effect of Provider Type on Generic Prescribing (reference = primary-care provider)
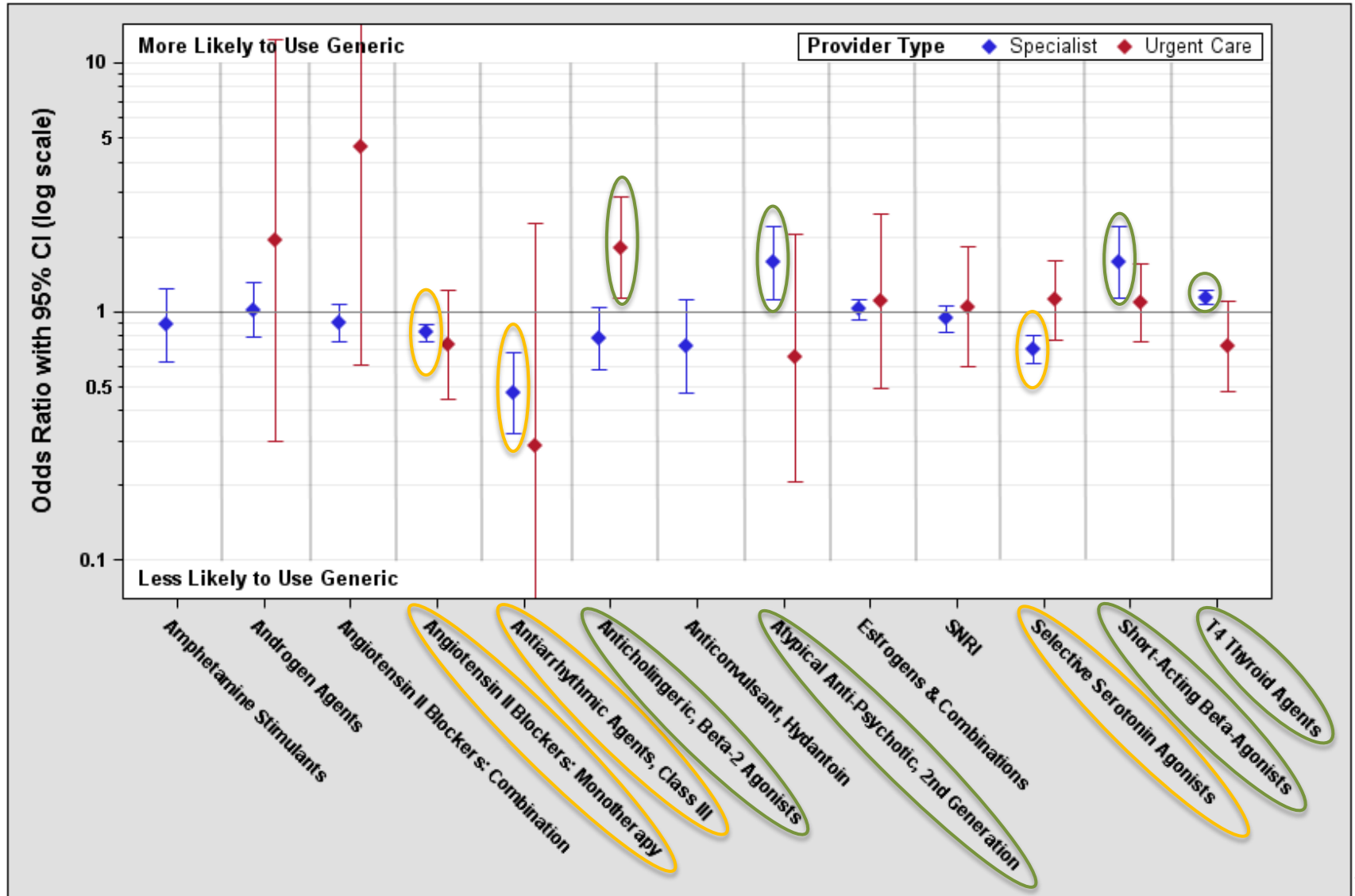
Effect of Product Experience on Generic Prescribing (reference = 0 Rx)

Conclusions

- Unexplained between-provider variation in outpatient generic prescribing differed by subclass

- PCPs are more likely to prescribe generic angiotensin II blocker monotherapies, anti-arrhythmia agents, and selective serotonin agonists than specialists, but less likely to prescribe generic anti-psychotic agents, short-acting beta-agonists, and T4 thyroid agents, *after controlling for patient and product volume*

- Physicians' past experiences with a product, *controlling for type of physician and patient volume*, appear to influence their propensity for prescribing a generic
  - Negatively influences generic prescribing of androgens, SNRIs, and T4 thyroid agents
  - Positively influences generic prescribing of estrogens and angiotensin II blocker monotherapies

Limitations

- Retrospective, cross-sectional study design

- For multiple products within a subclass, we assume that providers considered products therapeutically interchangeable

- Cannot know if findings are generalizable to other health systems or other regions of the U.S.

Future Direction

- Evaluate the role of provider groups (clinics)

- Within specific subclasses, evaluate the role of indication and/or disease severity
  - Diagnoses codes (e.g., COPD vs. asthma)
  - Biometrics or lab results (e.g., blood pressure, T4 hormone)

Implications

- Results from this study can be used to inform the design of:
    - Future studies to better understand differences in generic prescribing by provider type and product experience
    - Generic drug surveillance
    - Targeted interventions within a healthcare system to improve generic prescribing

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