

# Patterns of Stimulant Initiation

*Joshua Black, PhD*

Janetta Iwanicki, MD

Rocky Mountain Poison & Drug Safety

Denver Health and Hospital Authority

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# Objective & Outline

Objective: Quantify transitions in stimulant-related behaviors via analysis of ages of initiation

1. Survey flow overview
2. Statistics and interpreting latent transition analysis
3. Analysis of transitions between behaviors

Acknowledge the team effort in this work:  
Hannah Burkett, Alyssa Forber, Rick Olson, Kari Rockhill

# Study Design

- Standard NMURx Program survey launched in 3<sup>rd</sup> quarter 2021
- Participants who have used any stimulant in their lifetime were recontacted
  - Prescription or illicit; use or non-medical use
  - Recontact within 2 weeks of finishing primary survey
- Participants must confirm lifetime use of stimulant drugs
- Total of 1,329 participants analyzed, after all exclusions

# Study Design

- Participants were asked which drugs they have used and the age of initiation
- Participants were then asked a series of behavioral questions with age of initiation
  - Such as: “Have you ever used the stimulant below to improve athletic or academic performance without being told to by a healthcare provider?”
- Age of initiation of behaviors were analyzed to understand phenotypes (i.e., subpopulations ) of initiation behavior

# Behavioral Initiation Patterns

- Illicit vs prescription drug use
- Route of administration
- Reason for use
- Source of the drug

Question:

Do patterns emerge when we analyze all these in a multivariable manner?

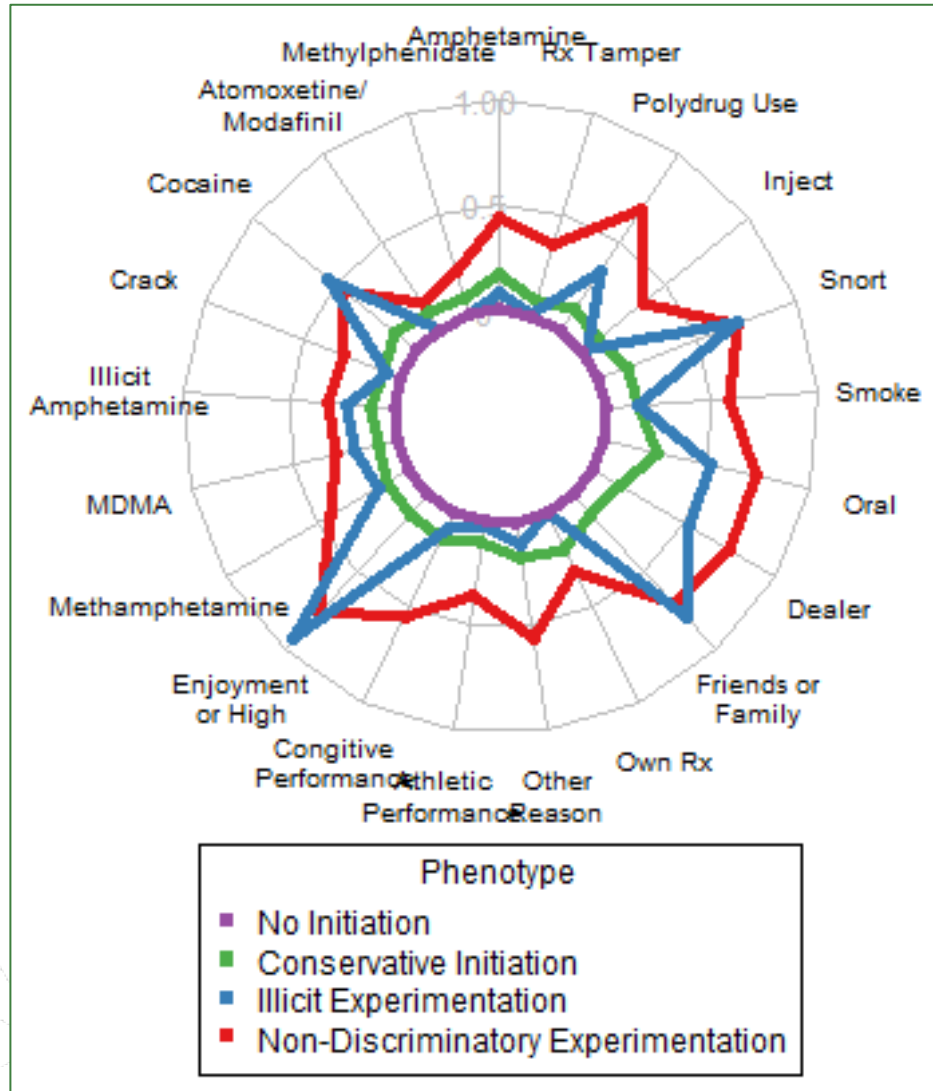
# Latent Transition Analysis (LTA)

- From the latent variable model family with core assumptions...
  - There exists unseen phenotypes that are universal across the sample, but manifest differently in each person
  - The unseen phenotypes can't be observed directly
  - The observed data are a consequence of the unseen phenotypes
- Latent class analysis decomposes overlapping responses into distinct patterns of behavior
  - Characterizes how individuals will initiate stimulant use patterns across range of behaviors
  - Behaviors define different patterns of initiation
- LTA is a transition model where individuals move between phenotypes over time

# Latent Transition Analysis



# Phenotype Interpretation



The underlying phenotypes definitions are constant across age windows, and individuals can move between statuses

Phenotypes represent patterns of *initiating new behaviors*, and not ongoing use. A person might continue to use, but stop initiation (i.e., go back to purple).

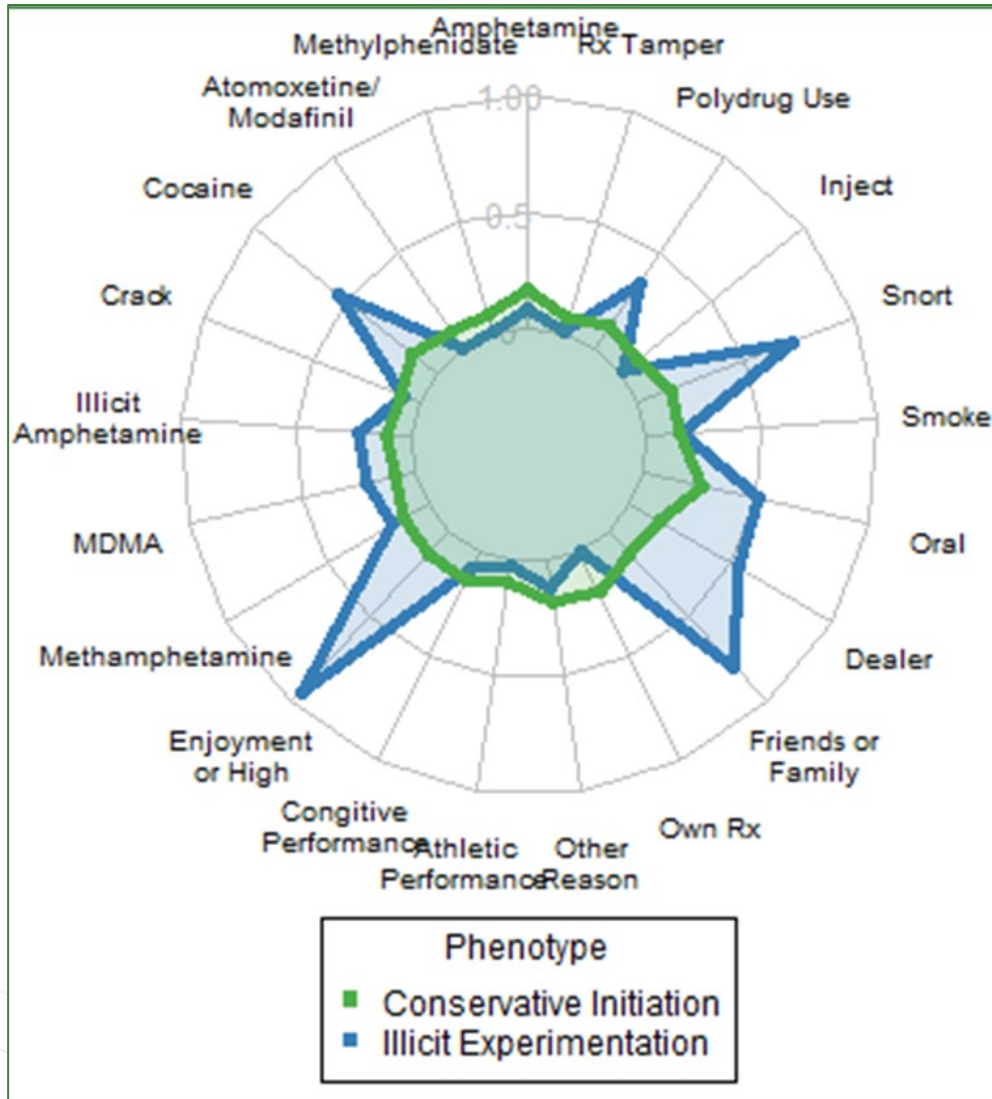
No Initiation: Zero probability of initiating new behavior

Conservative Initiation: Low probability of initiating some behavior

Illicit Experimentation: High probability of initiating illicit use to get high via snorting and/or oral. Modest polydrug use.

Non-Discriminatory Experimentation: Modest probability of initiating many different behaviors, including many different routes for a variety of reasons. High polydrug use.

# Phenotype Interpretation



## Conservative Initiation:

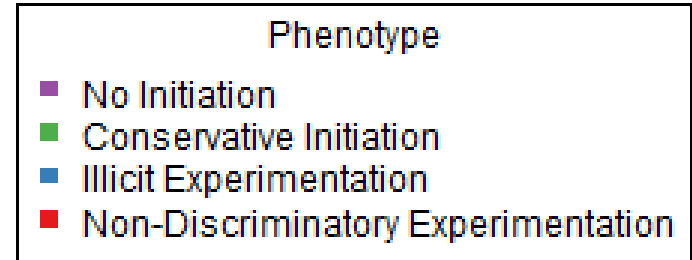
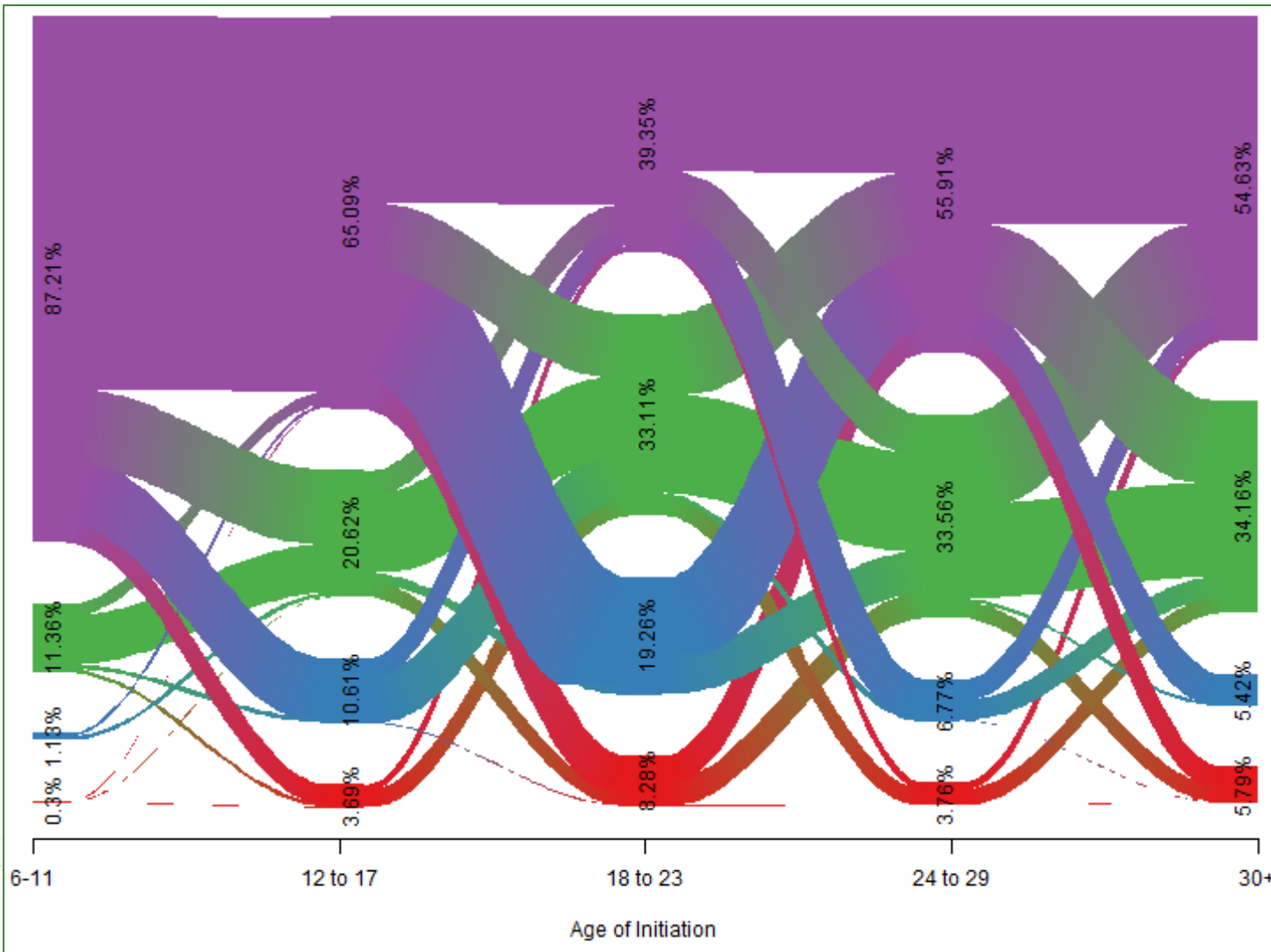
- No singular dominant drug/reason/route/source
- Usually characterized by choosing to try one or two behaviors
  - This could be a new drug, a new NMU reason, or new route
- Little polydrug use
- We interpret this as trying a new behavior, but not lots of new behaviors

## Illicit Experimentation:

- Clearly defined behavioral pattern
- Usually use of cocaine, obtained from F&F, to get high via either snorting or oral use
- Modest probability of polydrug use

Model did not find exclusive medical use phenotype in main analysis (observed in older birth cohort).

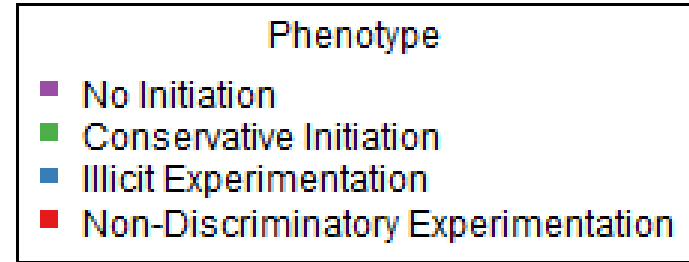
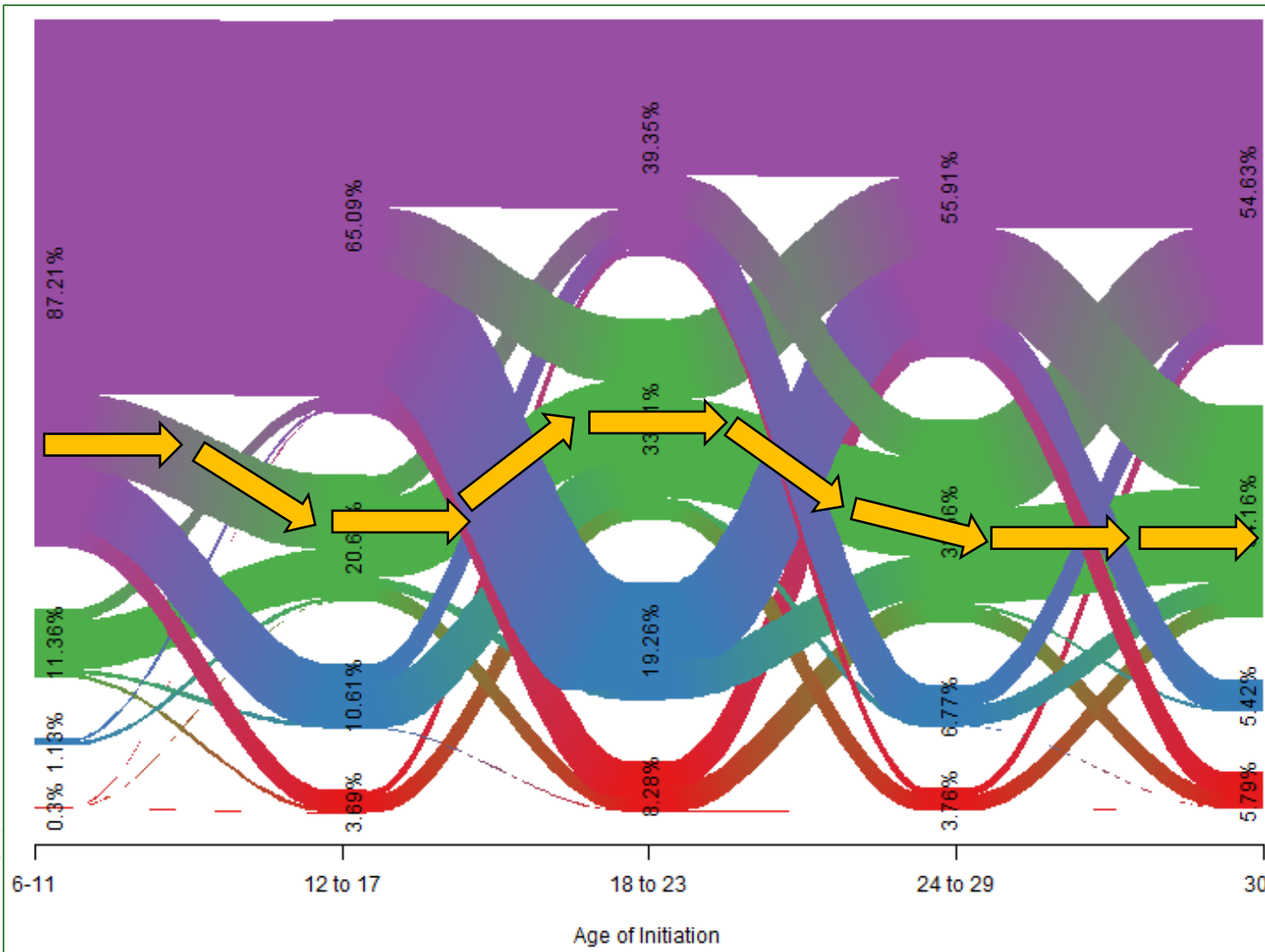
# Overall Sankey Plot Impressions



## Key Points

- Phenotype **Illicit experimentation** does not generally follow from **conservative initiation**
- The reverse is more likely, particularly leaving 12-17 ages
- Among all stimulant users, 60.6% were in one of the three initiating phenotypes in 18-23 ages (i.e., not in the **no initiation** status)
  - High risk window due to transitioning behavior

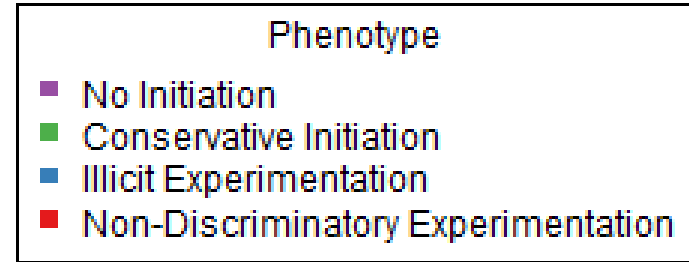
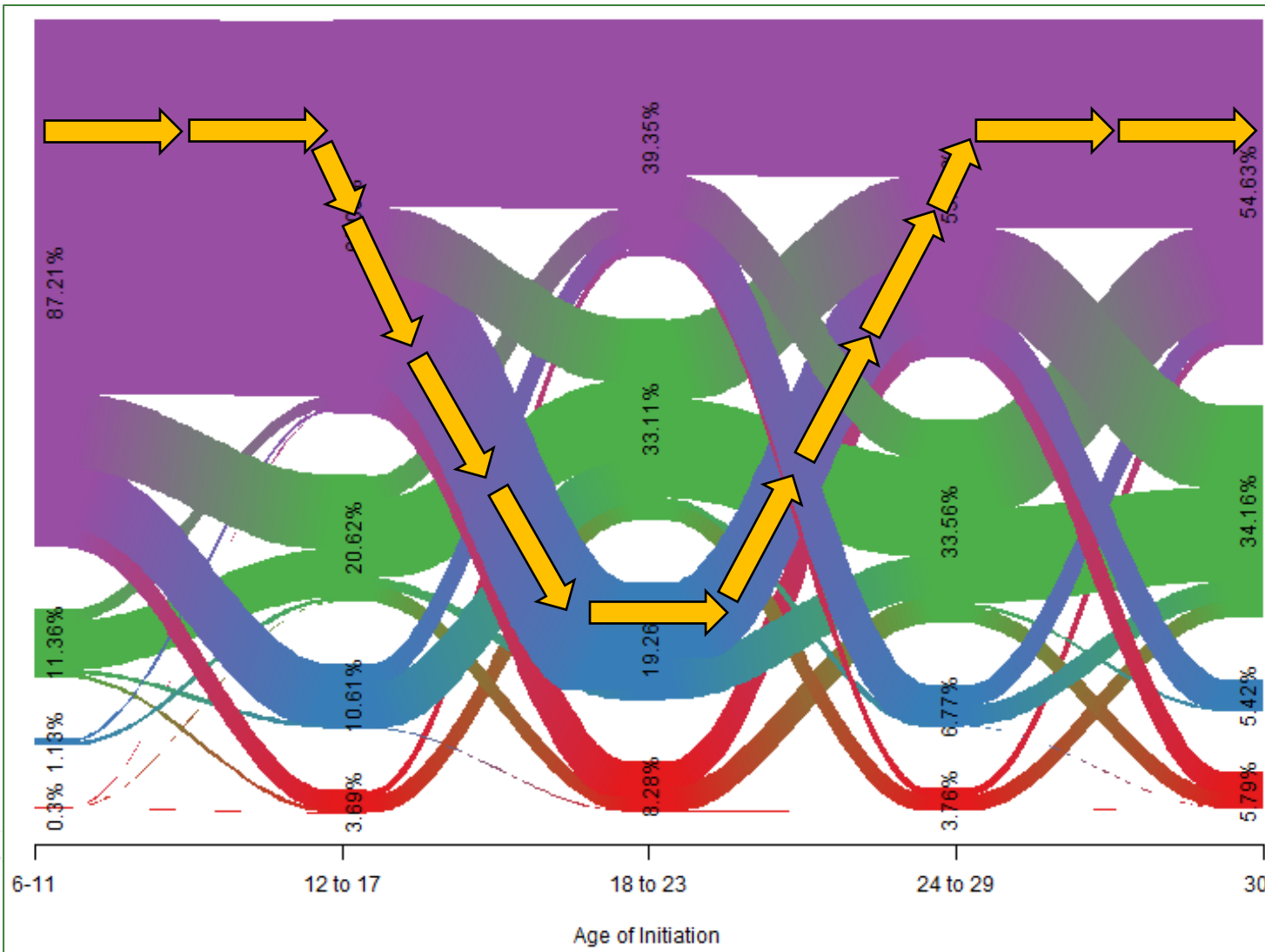
# Dominant Pathways



## Key Points

- 30.2% (402/1,329) were in only the **conservative initiation** and **no initiation** phenotypes
- 11.9% (158/1,329) entered **conservative initiation** for only a single period, and in **no initiation** otherwise

# Dominant Pathways

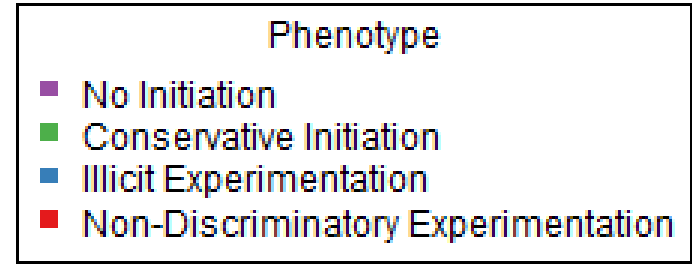
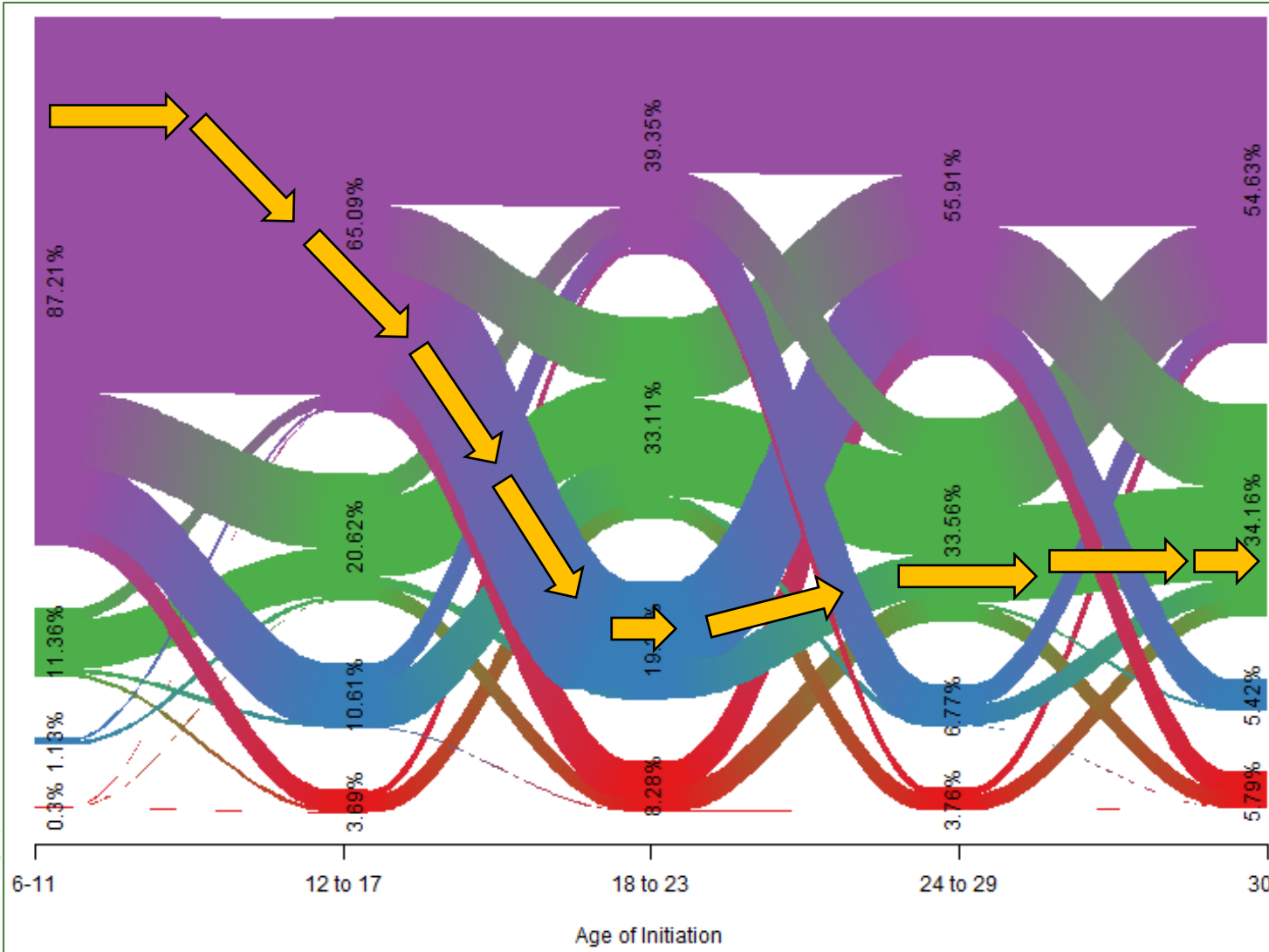


## Key Points

- In total, 19.9% (264/1,329) were only in the **illicit experimentation** or **no initiation** phenotypes
- The most common singular thread (shown), 9.8% (130/1,329), was directly to **illicit experimentation** in 18-23, then back to **no initiation**



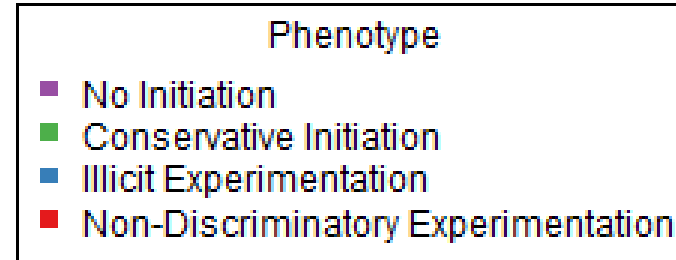
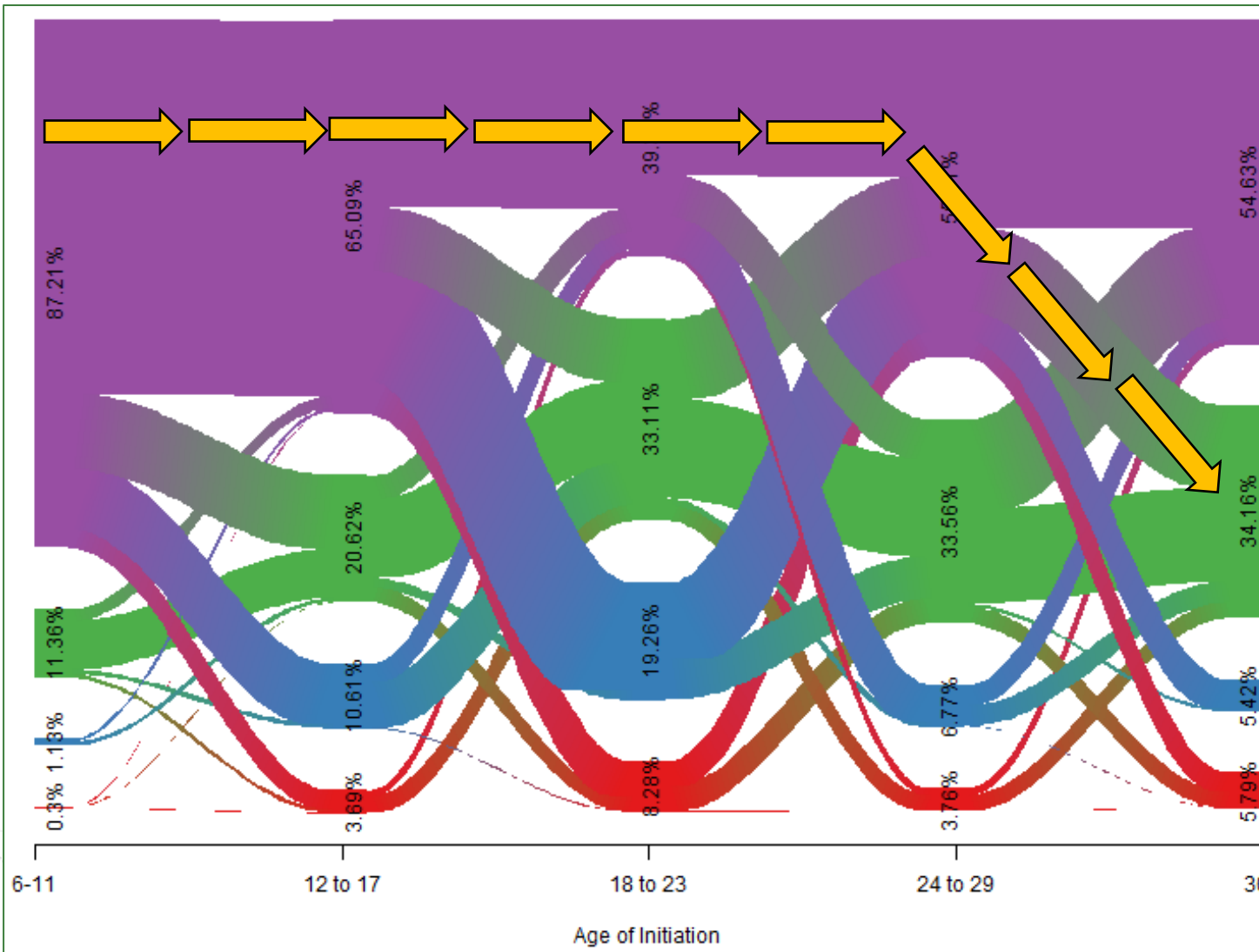
# Dominant Pathways



## Key Points

- 20.9% (278/1,329) enter **illicit experimentation** and move to **conservative initiation** later
- Only 3.5% entered **conservative initiation** that later led to **illicit experimentation**

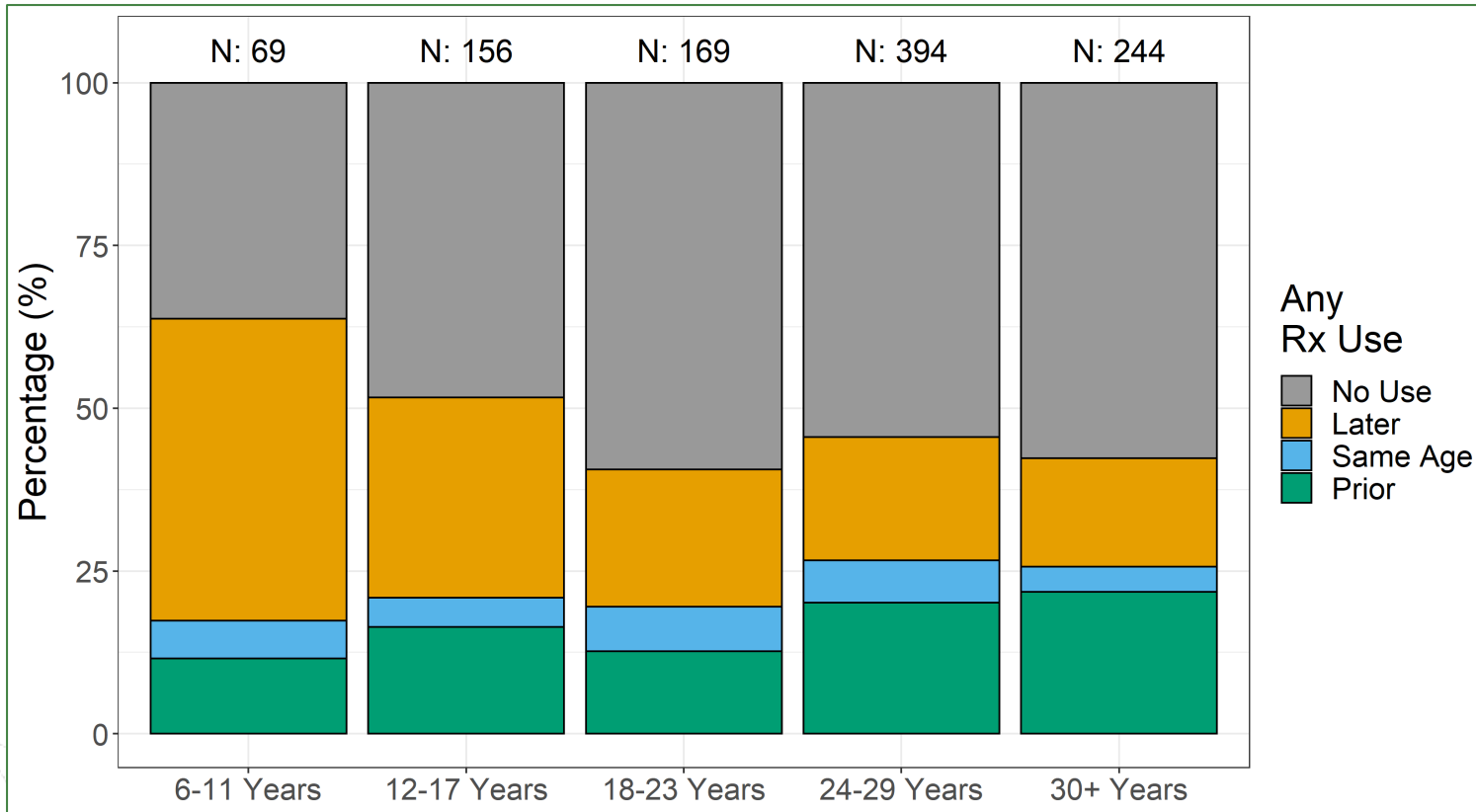
# Dominant Pathways



## Key Points

- The 2<sup>nd</sup> most common singular thread, 7.0% (93/1,329), moved to **conservative initiation** in  $\geq 30$
- Potentially adults aged  $\geq 50$  receiving ADHD diagnoses (birth cohort supports this)

# Prescription-Illicit Progression



Is the interpretation of phenotype transitions confirmed by age of initiation?

Examined the ages when Rx use was initiated among those who initiated illicit use (total N).

## Key Points

- Rx stimulant use happens only infrequently before illicit use (<25% for all age groups)
- Much more common to use Rx for the first time *after* first use of an illicit stimulant



# Strengths and Limitations

## Strengths

- Sourced sample from the general population, capturing more diverse use patterns
- Incorporated multiple types of behaviors into a single analysis of progression
- Engaged 2 methods to reduce measurement error

## Limitations

- No selection bias adjustment (composition & non-response)
- Cannot connect progressions to clinical outcomes (e.g., stimulant use disorder, hospitalization, or death)

# Conclusions

- Characterized 3 patterns of stimulant phenotype transitions
  1. **Conservative initiation only** (30%)
  2. **Illicit experimentation only** (20%)
  3. **Illicit experimentation** followed by **conservative initiation** (20%)
- Among those using Illicit stimulants....
  - Illicit use more likely preceded Rx use
  - Smaller group had Rx use precede illicit use
- Rx and illicit drugs not split in **conservative initiation** phenotype
  - Suggests a similarity in which drugs are used for NMU reasons
- Perceived risk could be a driving factor for why illicit use without prior prescription use is common
  - Friend and family acquisition could also reduce perceived risk

**Thank you!**

Joshua Black, PhD  
RADARS® System

Joshua.Black@RMPDS.org