



SCIENTIFIC
REGISTRY OF
TRANSPLANT
RECIPIENTS

Simulated Tier Variability

Nicholas Salkowski,¹ Andrew Wey,¹ Jon Snyder¹
SRTR, Hennepin Healthcare Research Institute,
Minneapolis, MN

Disclosures

Nicholas Salkowski, PhD
Biostatistician
SRTR, Hennepin Healthcare Research Institute,
Minneapolis, MN, USA

I have no financial relationships to disclose within the past 12 months relevant to my presentation.

AND

My presentation does/does not include discussion of off-label or investigational use

I do/do not intend to reference unlabeled/unapproved uses of drugs or products in my presentation

This work was supported wholly or in part by HRSA contract HHS-250-2015-00009C. The content is the responsibility of the authors alone and does not necessarily reflect the views or policies of the Department of HHS, nor does mention of trade names, commercial products, or organizations imply endorsement by the U.S. Government.



SCIENTIFIC REGISTRY OF
TRANSPLANT RECIPIENTS

Background

The Scientific Registry of Transplant Recipients semi-annually assigns transplant programs to one of five performance tiers for 1-year graft survival in its program-specific reports (PSRs).

Concerns have been expressed about historical variability in tier assignment over time.



SCIENTIFIC REGISTRY OF
TRANSPLANT RECIPIENTS

Historical Analyses

Spring 2017, fall 2014, and spring 2012 PSR reports for kidney programs were analyzed, providing up to three tier assignments for each program, and the intraclass correlation for the assigned tiers was 0.03 to 0.20 .

Historical analyses, however, have two important limitations:

- They cannot separate random variation from changes to programs over time.
- They cannot compare the observed tier assignments to the correct tier assignments.



SCIENTIFIC REGISTRY OF
TRANSPLANT RECIPIENTS

Simulation Study

To overcome these limitations, a simulation study was performed to assess the reliability of tier assignments when program effects are known and held constant.

Simulation parameters approximated the cohort of adult recipients of deceased donor kidneys in the January 2018 PSRs. One hundred PSR cohorts were simulated for 11,600 simulated programs (50 batches of 232) to produce 20 temporally independent tiers for each program.

Simulation studies have limitations, too! Reality is complicated, so simulations make simplifying assumptions. Although simulation design attempts to replicate the major features of reality, simulations aren't perfectly realistic.



SCIENTIFIC REGISTRY OF
TRANSPLANT RECIPIENTS

Results: Consistency

The intraclass correlation for the 20 independent tier assignments was $_{0.38}0.39_{0.40}$.

The intraclass correlations were $_{0.19}0.20_{0.21}$, $_{0.34}0.35_{0.36}$, and $_{0.56}0.57_{0.58}$ for programs with 0-3, 3-10, and >10 expected events, respectively.

So, there is substantially greater agreement in the simulated tiers than in the historical tiers.



Results: Agreement

A true tier was derived from the program effect for each simulated program.

The intraclass correlation between a single assigned tier and the true tier was 0.52^{0.54}_{0.55}, overall.

The intraclass correlations between a single assigned tier and the true tier were 0.26^{0.29}_{0.32}, 0.55^{0.57}_{0.59}, and 0.70^{0.72}_{0.74} for programs with 0-3, 3-10, and >10 expected events, respectively.

So, there is moderate agreement between the assigned tier and the true tier, especially for larger programs.



Results: Accuracy

The assigned tier matched the true tier 37.5% of the time.

The assigned tier matched the true tier 32.5%, 37.8%, and 44.4% of the time for programs with 0-3, 3-10, and >10 expected events, respectively.

The assigned tier was within one tier of the true tier 83.6% of the time, and 79.0%, 83.7%, and 90.0% of the time for programs with 0-3, 3-10, and >10 expected events, respectively.

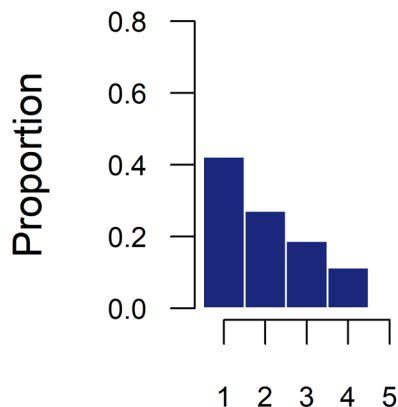


SCIENTIFIC REGISTRY OF
TRANSPLANT RECIPIENTS

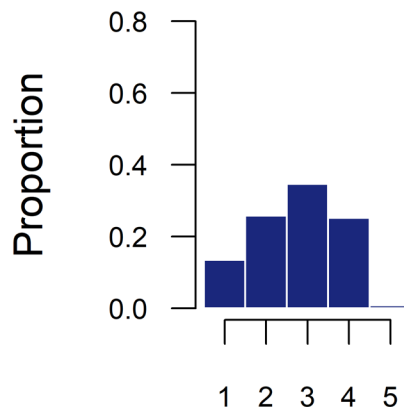
Accuracy: True Tier = 1

True Tier: 1

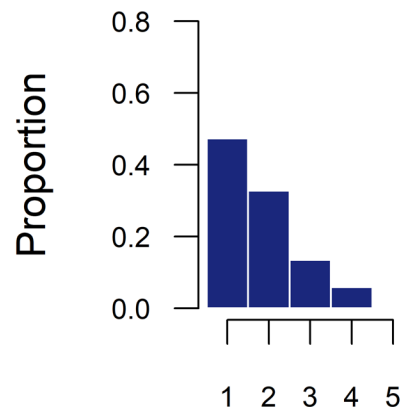
All



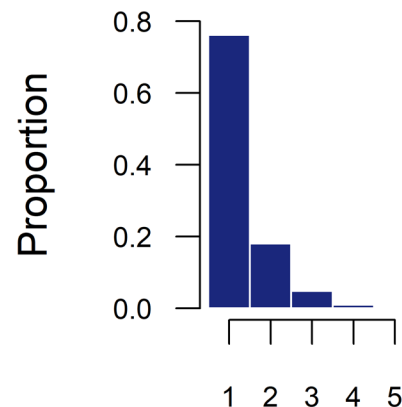
Expected: (0,3]



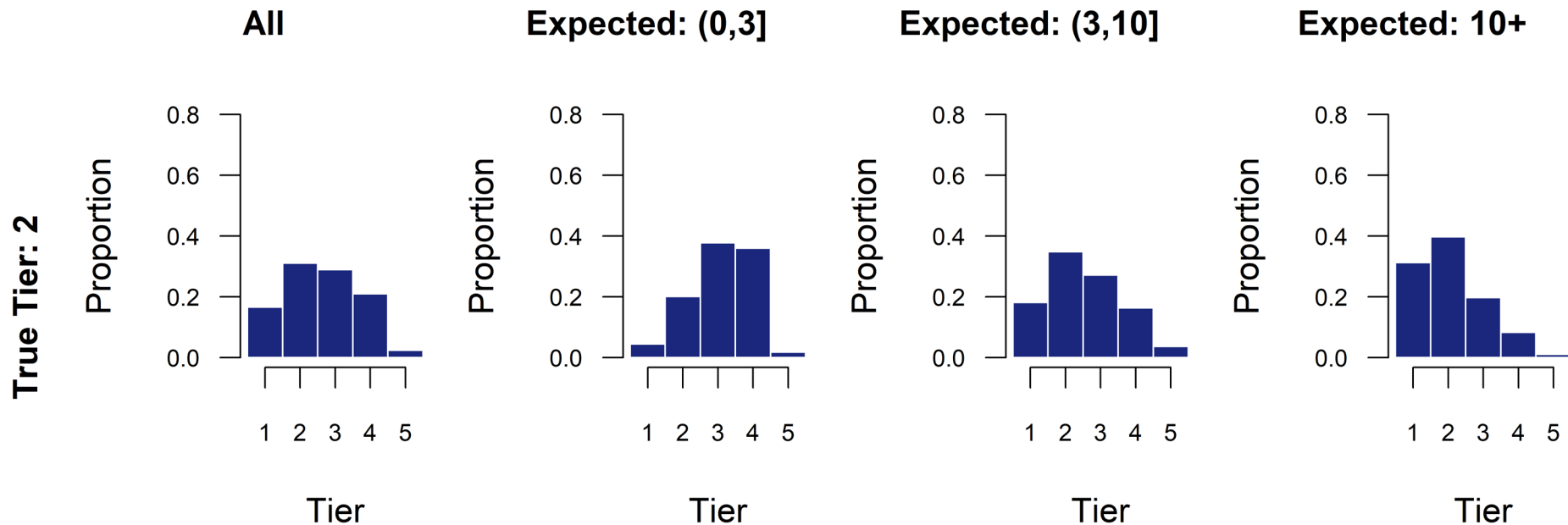
Expected: (3,10]



Expected: 10+



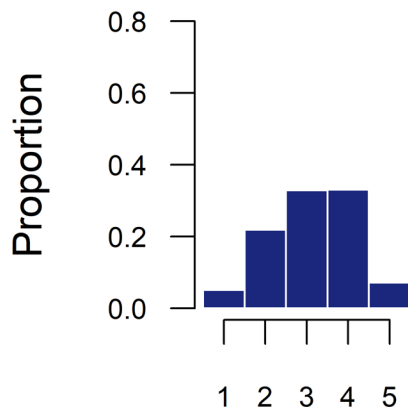
Accuracy: True Tier = 2



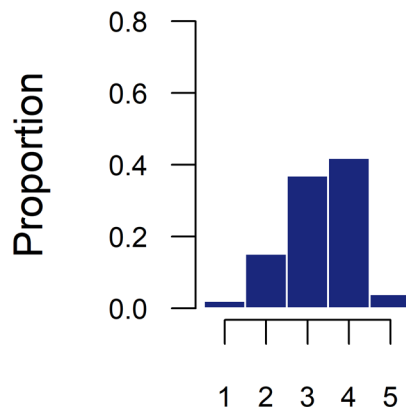
Accuracy: True Tier = 3

True Tier: 3

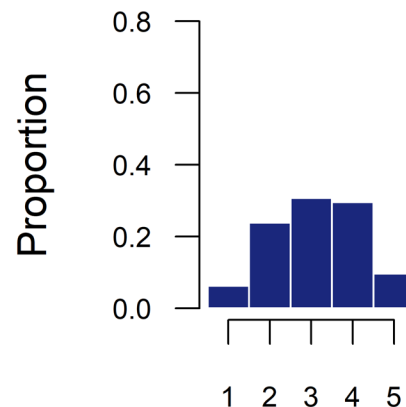
All



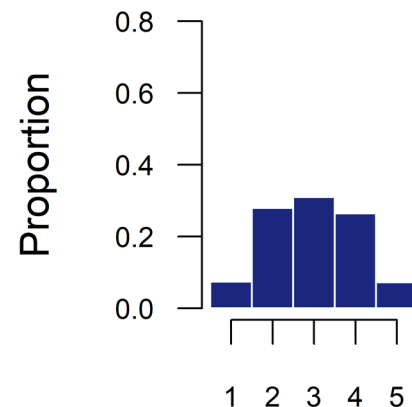
Expected: (0,3]



Expected: (3,10]



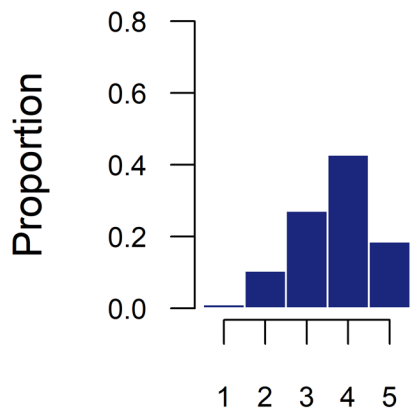
Expected: 10+



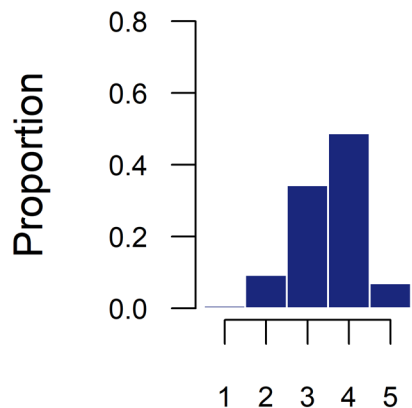
Accuracy: True Tier = 4

True Tier: 4

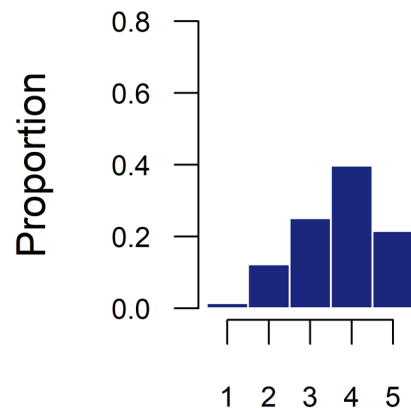
All



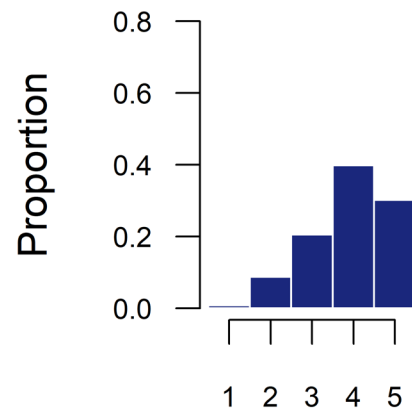
Expected: (0,3]



Expected: (3,10]



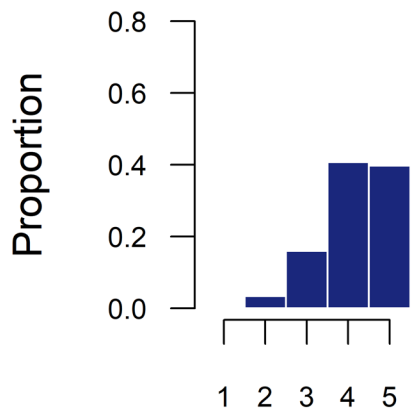
Expected: 10+



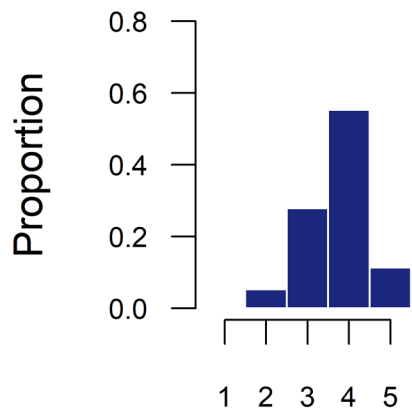
Accuracy: True Tier = 5

True Tier: 5

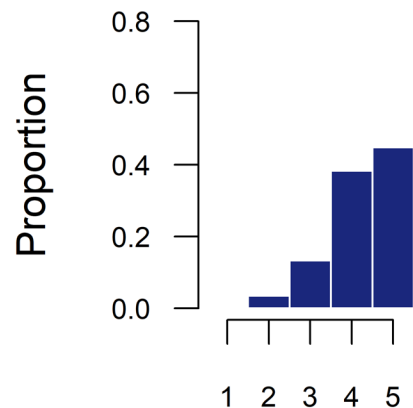
All



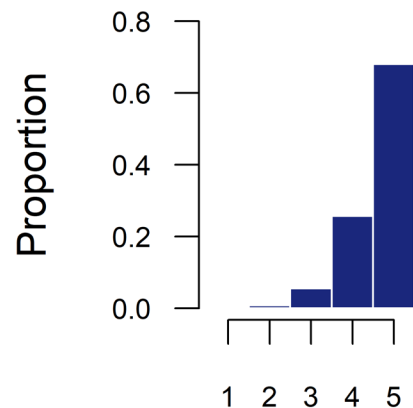
Expected: (0,3]



Expected: (3,10]



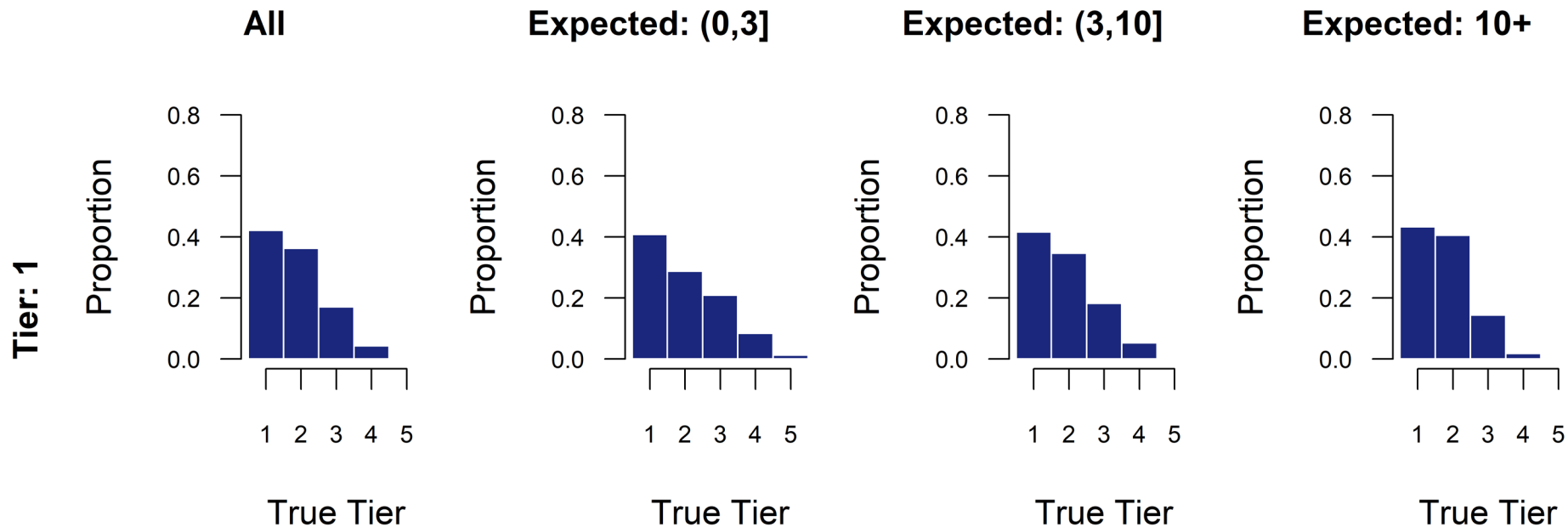
Expected: 10+



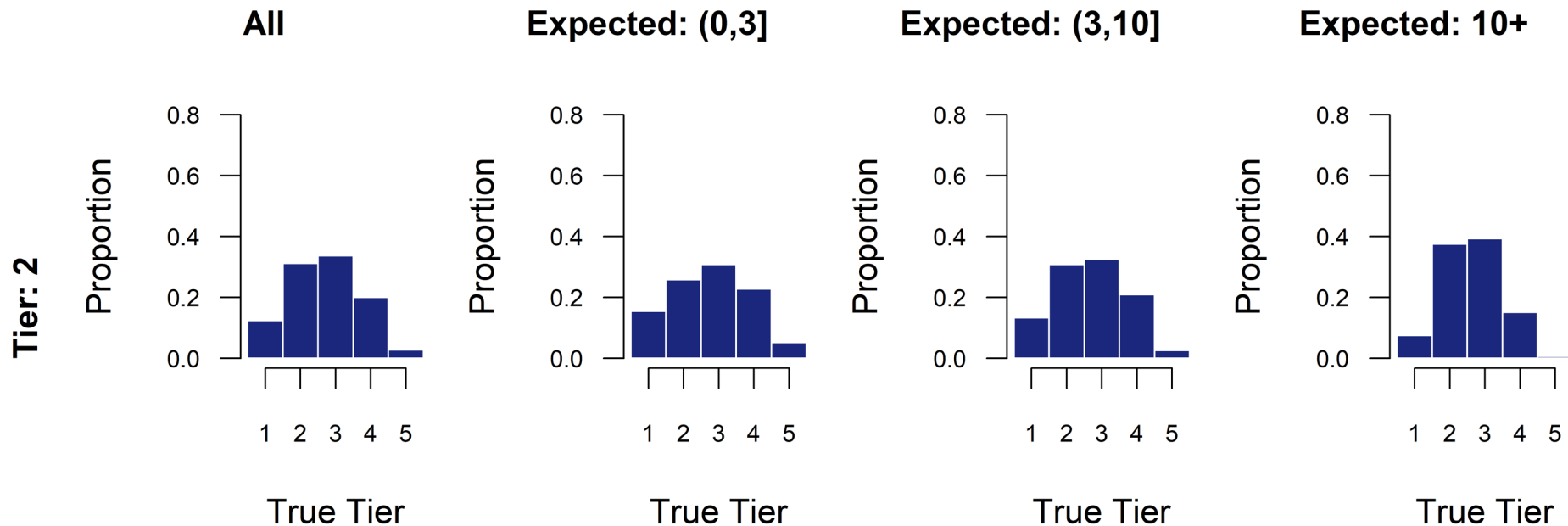
Conclusions

- Consistency for simulated programs was substantially higher than historical consistency, which suggests that real-world programs change over time.
- Consistency is higher for larger programs and lower for smaller programs.
- Agreement between the assigned tier and the true tier is fairly high for large programs, but low for small programs.
- Tiers often differ from true tiers, but usually the difference is one tier or less.
- The more data are available for a given program, the more likely the assigned tier is correct, or close to correct.

Prediction: Assigned Tier = 1



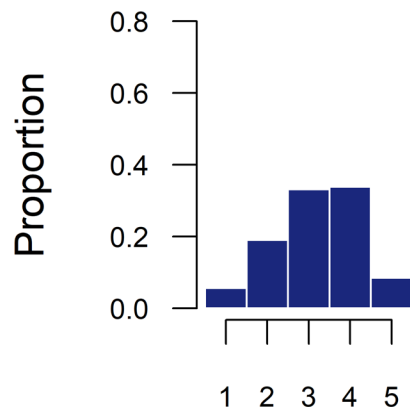
Prediction: Assigned Tier = 2



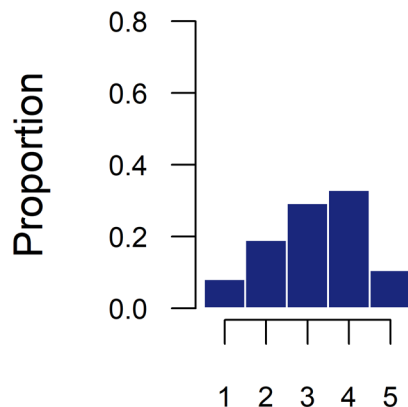
Prediction: Assigned Tier = 3

Tier: 3

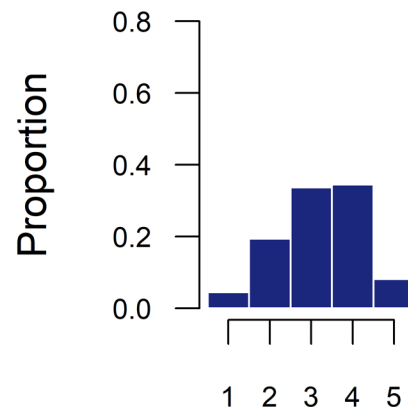
All



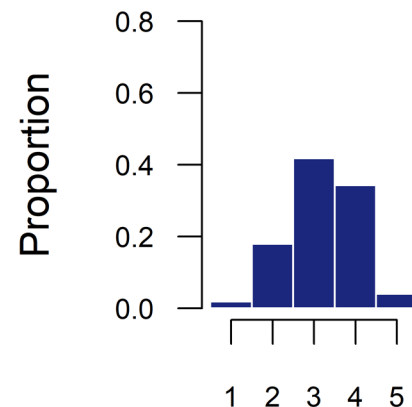
Expected: (0,3]



Expected: (3,10]



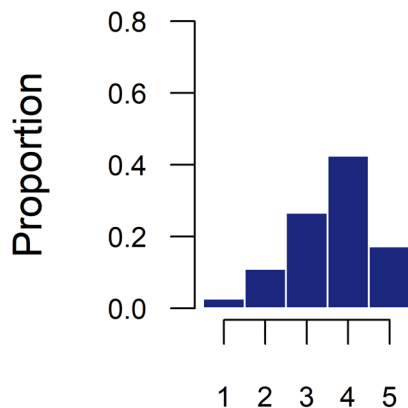
Expected: 10+



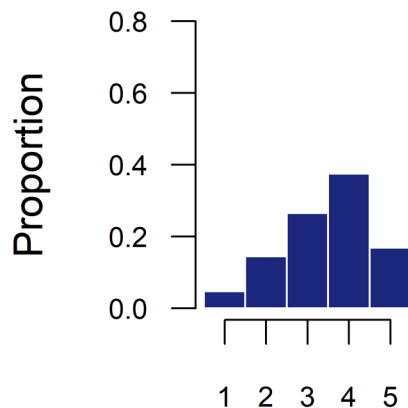
Prediction: Assigned Tier = 4

Tier: 4

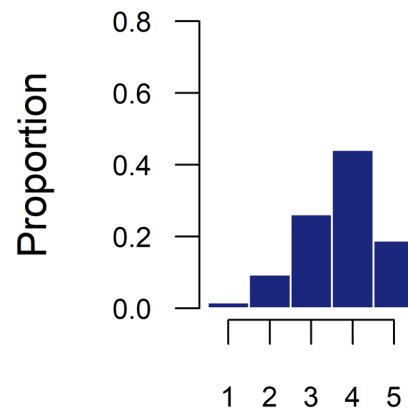
All



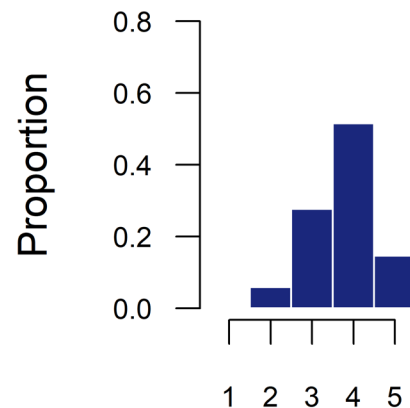
Expected: (0,3]



Expected: (3,10]



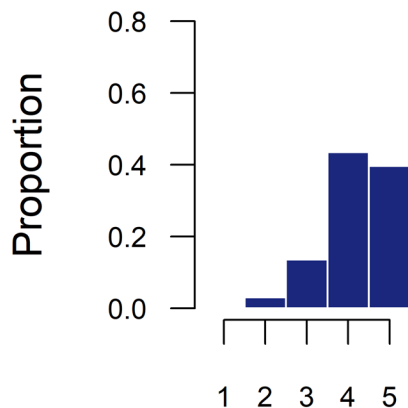
Expected: 10+



Prediction: Assigned Tier = 5

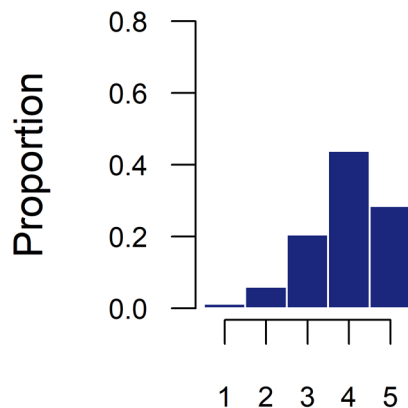
Tier: 5

All



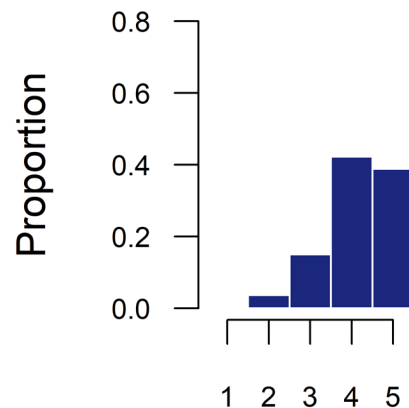
True Tier

Expected: (0,3]



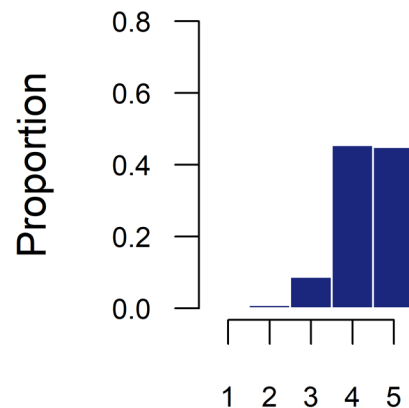
True Tier

Expected: (3,10]



True Tier

Expected: 10+



True Tier