



# Data to Support Golf Course Design

Presented to American Society of Golf Course Architects

David Pierce

Director of Research, USGA Green Section

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# Research Questions

- How far do golfers believe they hit shots versus their measured hitting distance with a launch monitor?
- How do the presence of various penalty areas impact a golfer's club selection or swing?
- How do forced carries in front of a green impact golfers?
- Do golfers expect to have the same club in hand as other golfers on par 3 tee shots and par 4/5 approach shots?

# Outline

- For Each Research Topic:
  - Description of how the study was performed
  - Key results
  - Continuing research, if any
- Putting it all together – the industry supported “Best Tees” program
- Where to get more information



An aerial photograph of a golf course. The landscape is a mix of vibrant green fairways and roughs, and a large, irregularly shaped sand trap in the center. The lighting is bright, casting shadows that emphasize the contours of the terrain. The text 'Question 1' is overlaid in the top left corner.

# Question 1

HOW FAR DO GOLFERS BELIEVE THEY HIT SHOTS VERSUS THEIR MEASURED HITTING DISTANCE WITH A LAUNCH MONITOR?



# How was the study performed?

- Prior to 2023, ~365 golfers were surveyed and tested using TrackMan at public or private club driving ranges
- 15 to 20-minute process per golfer
  - 5 to 7-minute survey on iPad
    - Demographics / skill level
    - Tee selection / playing distances / golf behaviors
    - Shot distances
    - Equipment inventory / test conditions
  - Hitting performance testing
    - 7 shots each with driver, 7-iron and pitching wedge
    - Defining new terms:
      - Average of best 2 shots = “capability”
      - Median = “ability”

# Golfer Performance Data – Average Golfer Ability

Gender	Driver	7-iron	PW
Female Distance (yds)	150	100	70
Male Distance (yds)	213	142	102
Estimated vs. Measured	+8.7%*	+4.2%	0.0%

*\*Golfer's estimate equals their capability – best drives*

# Research in progress

- Our goal is to test an additional 500 golfers in 2023
  - ~225 golfers tested year to date
  - Database to be updated and published by the end of the year on [USGA.org](https://www.usga.org) with the full distribution of shortest to longest hitting golfers by gender



# Question 2

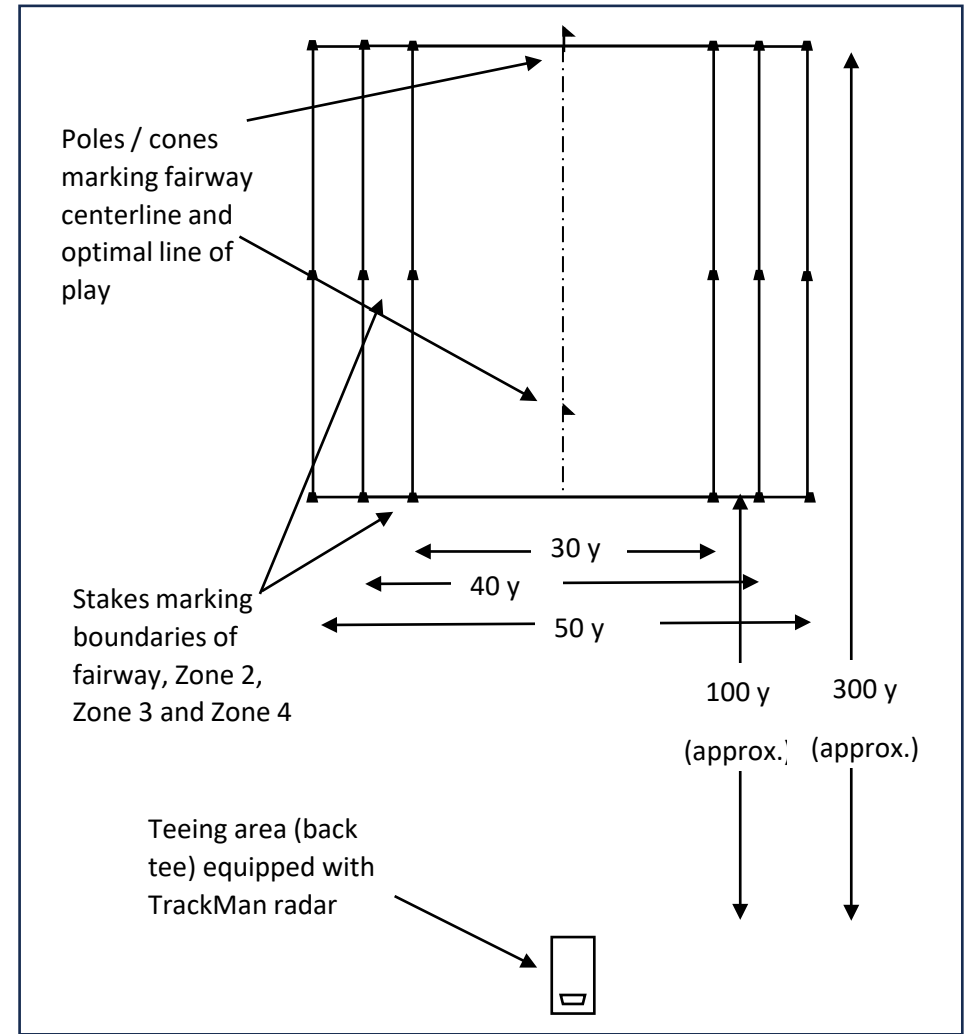


HOW DO THE PRESENCE OF VARIOUS PENALTY AREAS IMPACT A GOLFER'S CLUB SELECTION OR SWING?



# How was the study performed?

- A 30-yard-wide fairway with zones left and right of the fairway was set up using different colored stakes on Hole 1 of Pinehurst Course No. 2.



# How was the study performed?

- Golfers competed for prizes based on lowest net score
- Golfers hit five drives each under four different scenarios: (20 total shots)
  - Shots 1 – 5: Rough only on both sides of the fairway
  - Shots 6 – 10: Rough on slice side; lateral hazard then O.B on draw side
  - Shots 11 – 15: Lateral hazard and O.B on both sides
  - Shots 16 – 20: Close O.B on slice side, rough only on draw side
- Hole length scaled to golfer’s hitting distance
- TrackMan used for distance and accuracy
- Golfers were questioned after each scenario
  - Aiming bias
  - Intended effort / swing speed

## Scoring Table for Scenario 2: Shots 6 - 10

3.4.2 One-sided Penalty Area Format

Hole Length:

Blue = 400 yds (typical approach = 160 yds)  
 White = 350 yds (typical approach = 140 yds)  
 Green = 300 yds (typical approach = 120 yds)  
 Red = 250 yds (typical approach = 100 yds)

Long Drive	Blue = >260 White = >230 Green = >200 Red = >170	O.B. 6.4	Lateral Hazard 5.2	Rough 4.2	Fairway 4.0	Rough 4.2	Rough 4.2	Rough 4.2
Typical Drive	Blue = 220 - 260 White = 190 - 230 Green = 160 - 200 Red = 130 - 170	O.B. 6.4	Lateral Hazard 5.6	Rough 4.6	Fairway 4.3	Rough 4.6	Rough 4.6	Rough 4.6
Short Drive	Blue = <220 White = <190 Green = <160 Red = <130	O.B. 6.4	Lateral Hazard 6.2	Rough 5.2	Fairway 4.8	Rough 5.2	Rough 5.2	Rough 5.2
Miss Hit Drive	Blue = <150 White = <120 Green = <90 Red = <60	O.B. 6.4	Lateral Hazard 6.4	Rough 6.0	Fairway 5.5	Rough 6.0	Rough 6.0	Rough 6.0



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# Key Results

- For every shot, golfers selected driver.
- Based on no measured changes in swing speed, it is unlikely that players will consciously or subconsciously attempt to reduce their driving distance to be more accurate when faced with lateral penalty areas or O.B.
- Golfers are challenged by 30-yard-wide fairways as lateral hazards within 5 & 10 yards of the fairway are in play.
  - A fairway of constant width is more challenging to hit for longer hitters than shorter hitters.
- Hazards within 20 & 25 yards of fairway centerline affect golfer's swing path.
  - Golfers subconsciously adjust swing path significantly for fade hazards and mildly for two-side hazards even though in general they don't acknowledge this intention.



# Question 3

HOW DO FORCED CARRIES IN FRONT OF A GREEN IMPACT GOLFERS?





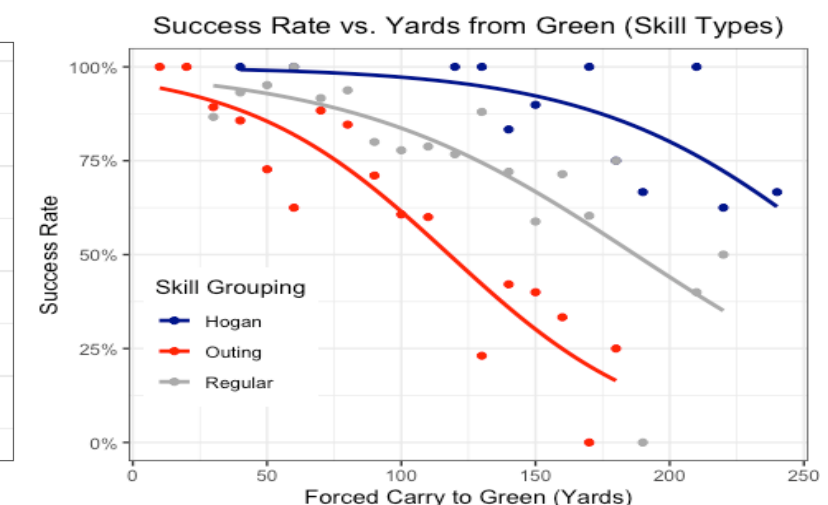
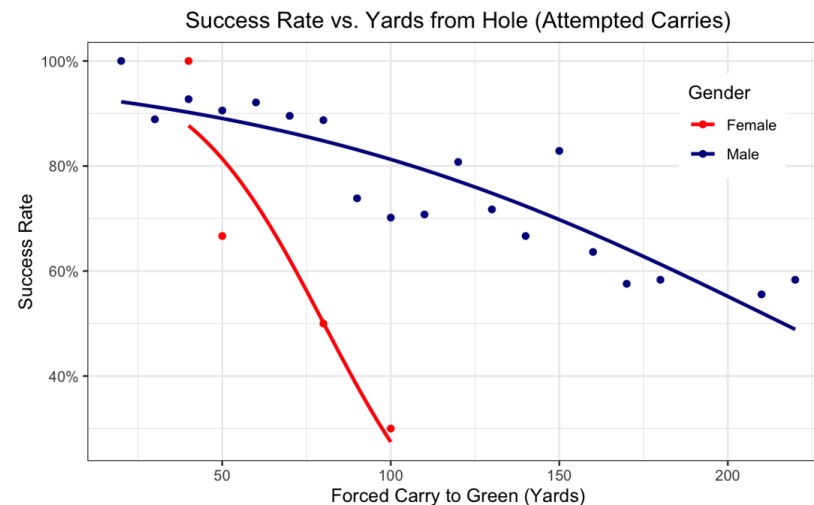
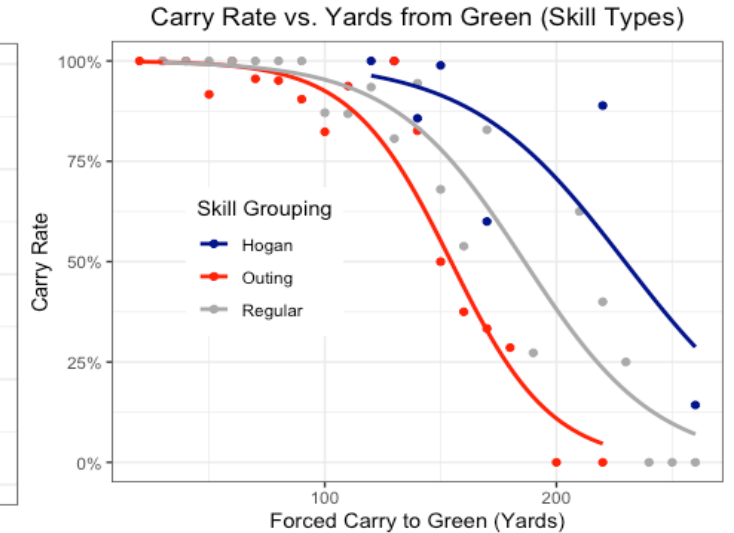
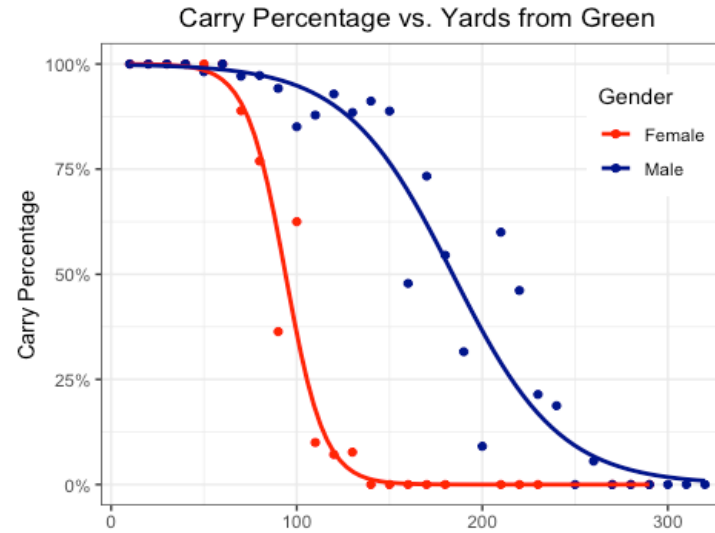
# How was the study performed?

- In 2021, three different holes with forced carries in front the green were studied.
- The golfers' distance from the flagstick was measured, and then they were observed to determine whether they attempted to lay-up or carry the hazard.
- Over the course of three weeks, 1350 shots were observed on three different holes (a par 3, a par 4 and a par 5).
- Because the only demographic information discernable was the golfer's presumed gender, many golfers were measured to approximate the overall golfer population.
- In addition to gender, three distinct skill groups of golfers were observed during the data collection period.
  - A one-day event for highly skilled male golfers. Most of the golfers in the event had a single digit or better Handicap Index®.
  - Play by members and guests. Most of the golfers in this group are very familiar with the course.
  - "Outings" refer to measurements made during three Monday outings. The golfers playing during these outings included less experienced golfers that were not typically members of the club.



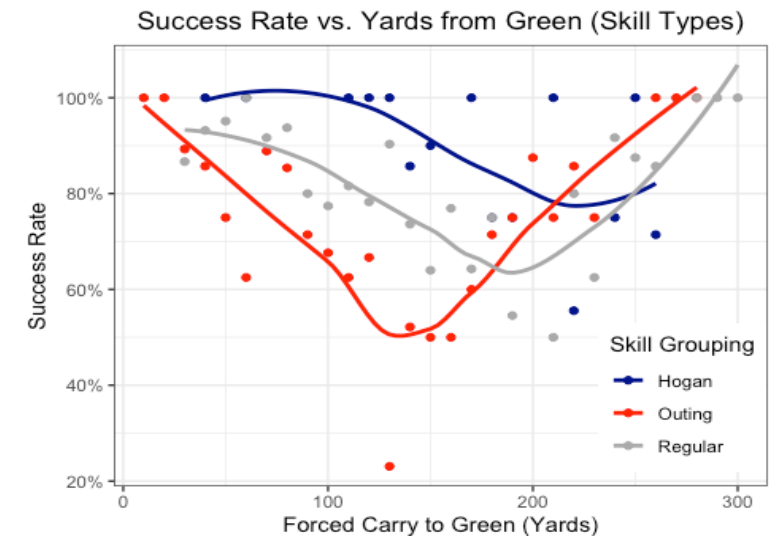
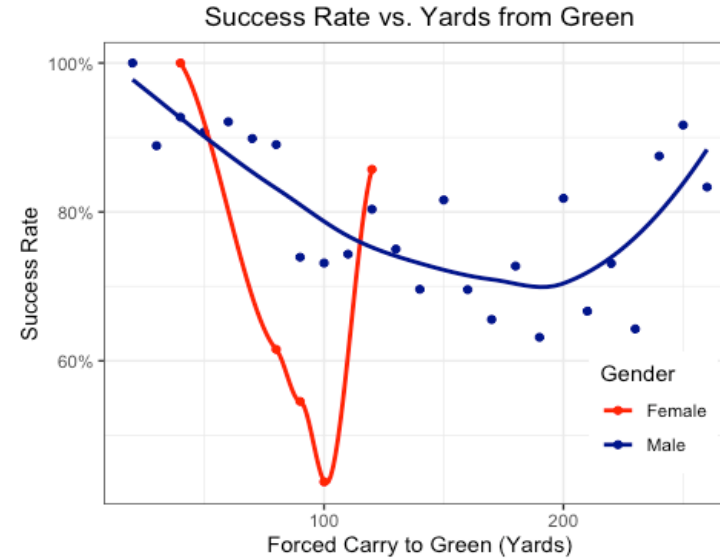
# Key Results

- All golfers have a decreasing success rate as the length of forced carries increases.
- Females have a sharper decrease in success rate compared to males.
- More skilled male golfers have higher success rates at longer distances compared to lower skilled male golfers
- No surprise, but we have quantified it!



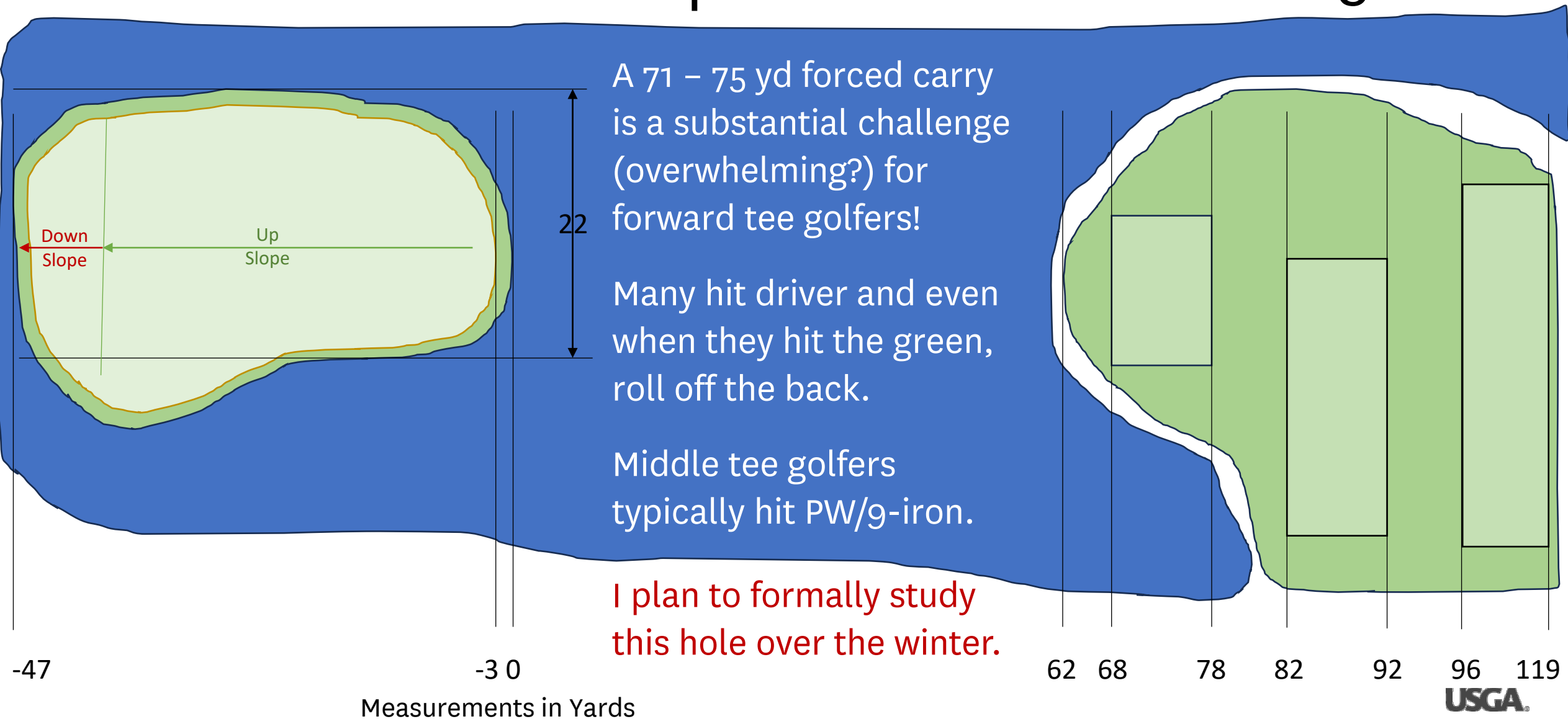
# Key Results

- Success rates on all shots for all types of golfers tend to increase at relatively long distances as more golfers decide to lay up instead of attempting to carry resulting in “V” shaped curves.
- Male golfers attempt forced carries and succeed more often at longer distances compared to female golfers.
- Higher skilled male golfers attempt forced carries and succeed at longer distances compared to less skilled male golfers.
- Forced carries of more than ~60 yards significantly impact female golfers.





# Anecdotal Example – Island Green Par 3



# Question 4

DO GOLFERS *EXPECT* TO HAVE THE SAME CLUB IN HAND AS OTHER GOLFERS ON PAR 3 TEE SHOTS AND PAR 4/5 APPROACH SHOTS?



# How was the study performed?

- Golfer Experience & Distance surveys were performed in 2019, 2021 and 2023 by Sporting Insights (U.K.)
  - In 2019, ~68,000 golfers responded globally
  - In 2021, ~20,000 golfers from the U.S. responded
  - In 2023, ~65,000 golfers from the U.S. responded
- In the 2023 GX survey, a question was added about the expected approach club needed on middle length par 3s, 4s & 5s

# What hole lengths do golfers prefer?

- Calculated Approach Club from '21 & '23 Survey Responses

Hole Par	Shortest	Middle	Longest
3	Gap Wedge	6-iron	3-wood
4	Gap Wedge	6-iron	3-wood
5	Pitch Shot	9-iron	6-iron

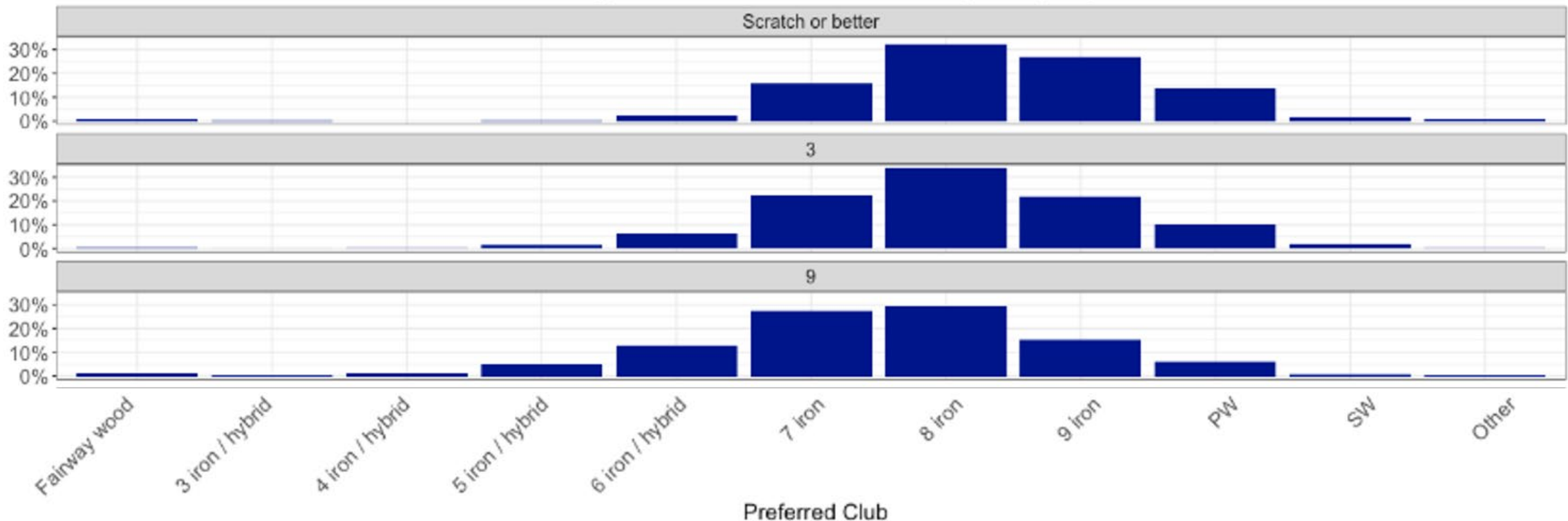
- When golfers are directly asked for middle length par 3/4/5 holes, 7-iron / 7-iron /PW are the median clubs preferred ('23 Survey) – one club shorter for each hole par



# Key Results

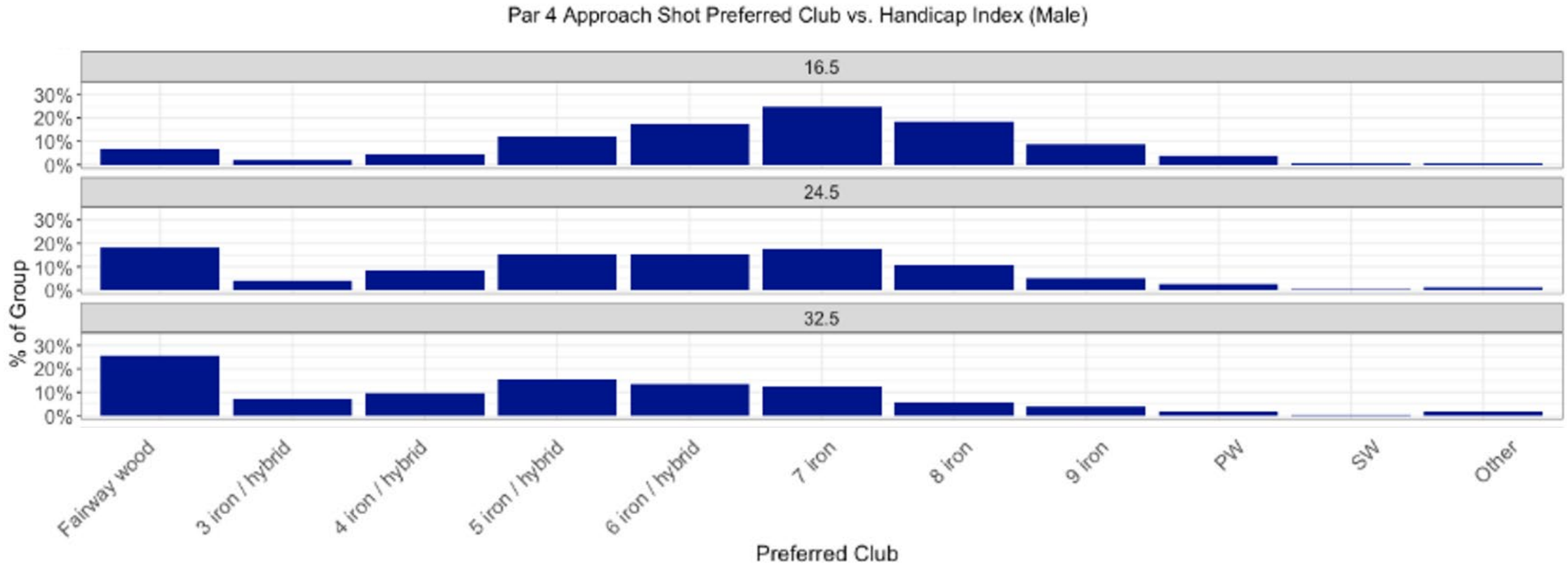
*The best male golfers expect to hit short clubs (7 to 9-iron) into greens. The trend is the same for par 3 & 5 holes.*

Par 4 Approach Shot Preferred Club vs. Handicap Index (Male)



# Key Results

*Less skilled male golfers expect to hit longer clubs (5 to 8-iron) into greens. The trend is the same for par 3 & 5 holes.*

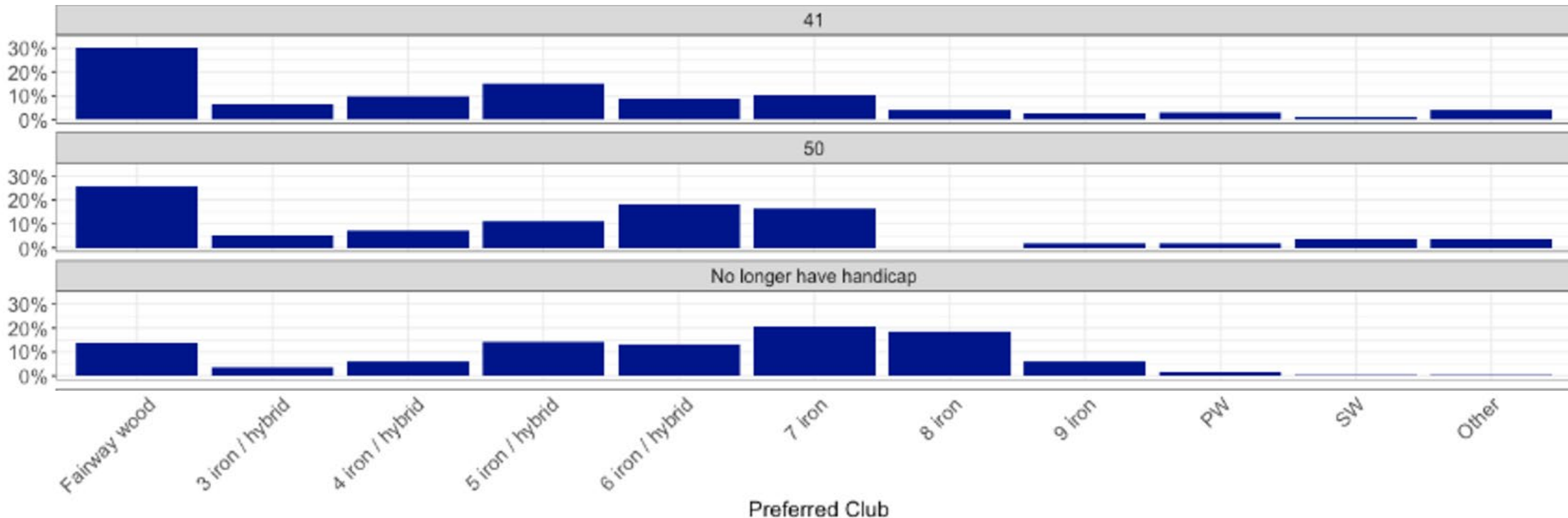




# Key Results

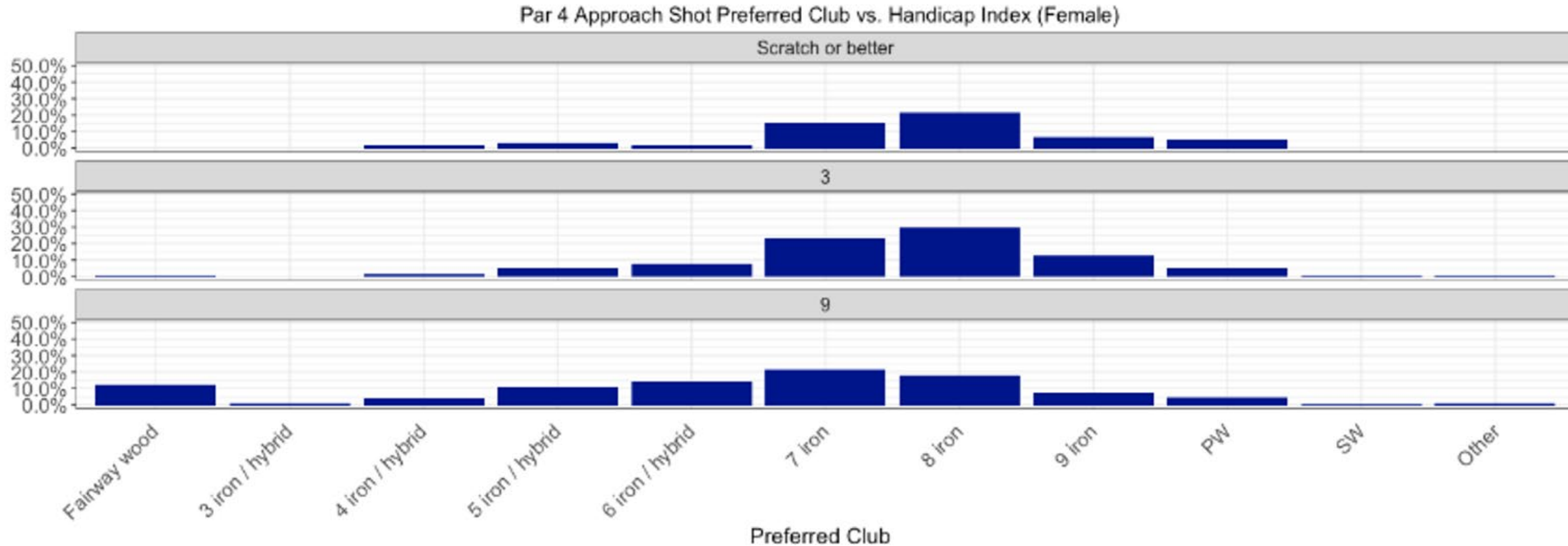
*25 – 30% of the least skilled male golfers expect to hit their longest clubs (fairway wood) into greens. The trend is the same for par 3 & 5 holes.*

Par 4 Approach Shot Preferred Club vs. Handicap Index (Male)



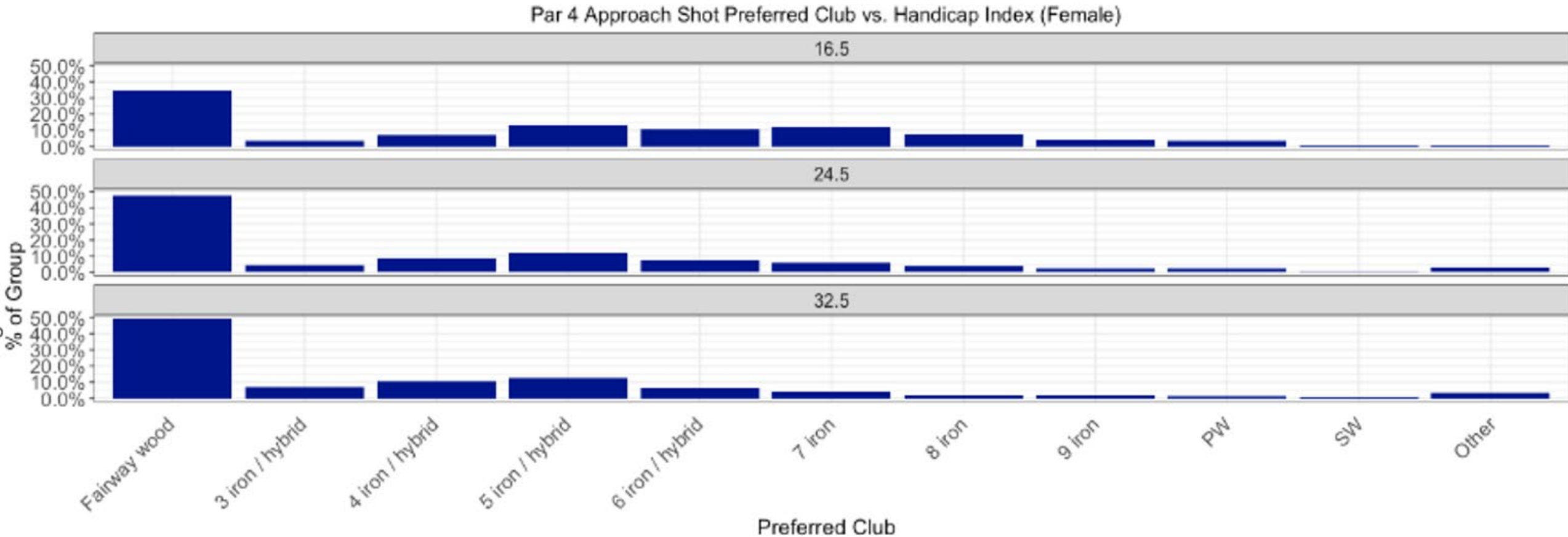
# Key Results

*The best female golfers expect to hit short clubs (7 to 8-iron) into greens. The trend is the same for par 3 & 5 holes.*



# Key Results

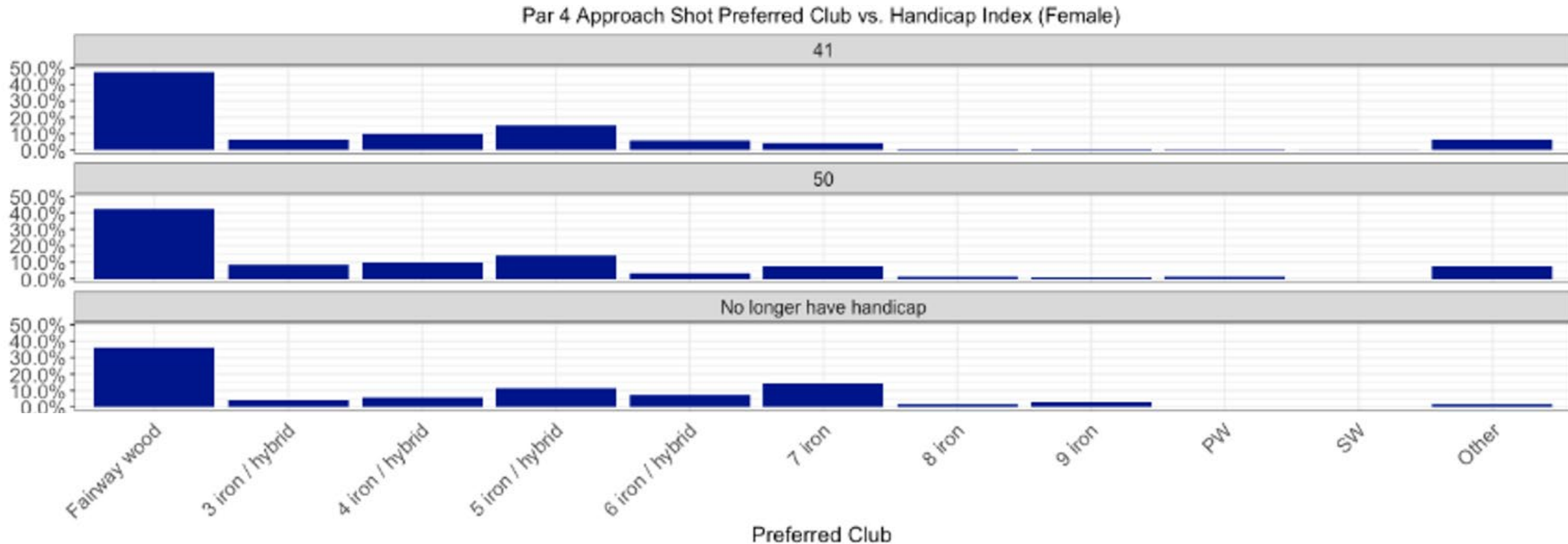
*Less skilled female golfers expect to hit longer clubs into greens and there is a significant group of female golfers that expect to hit their longest clubs into greens. The trend is the same for par 3 & 5 holes.*





# Key Results

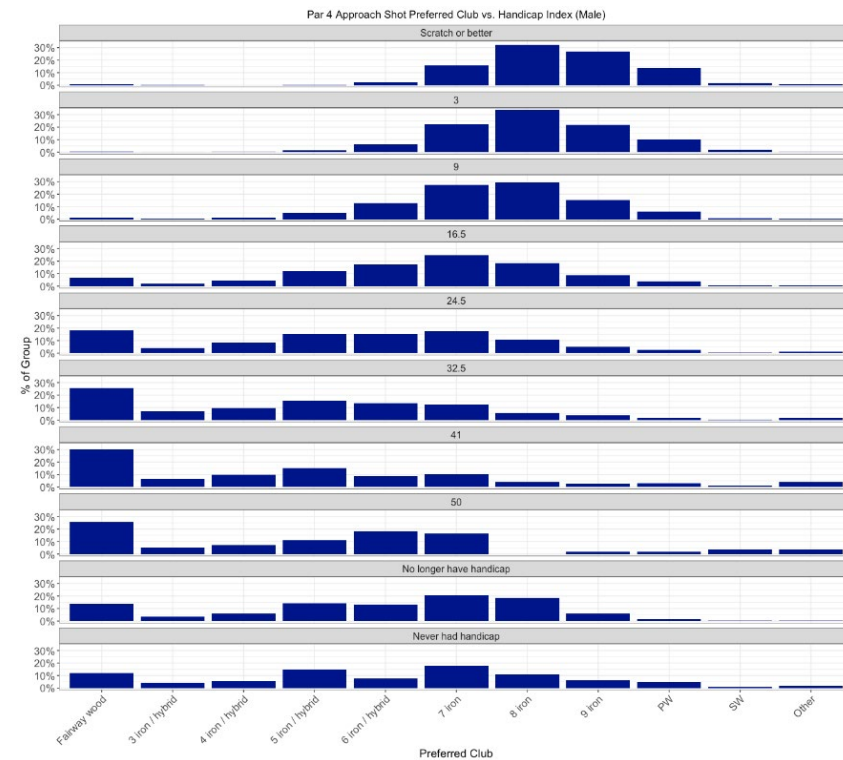
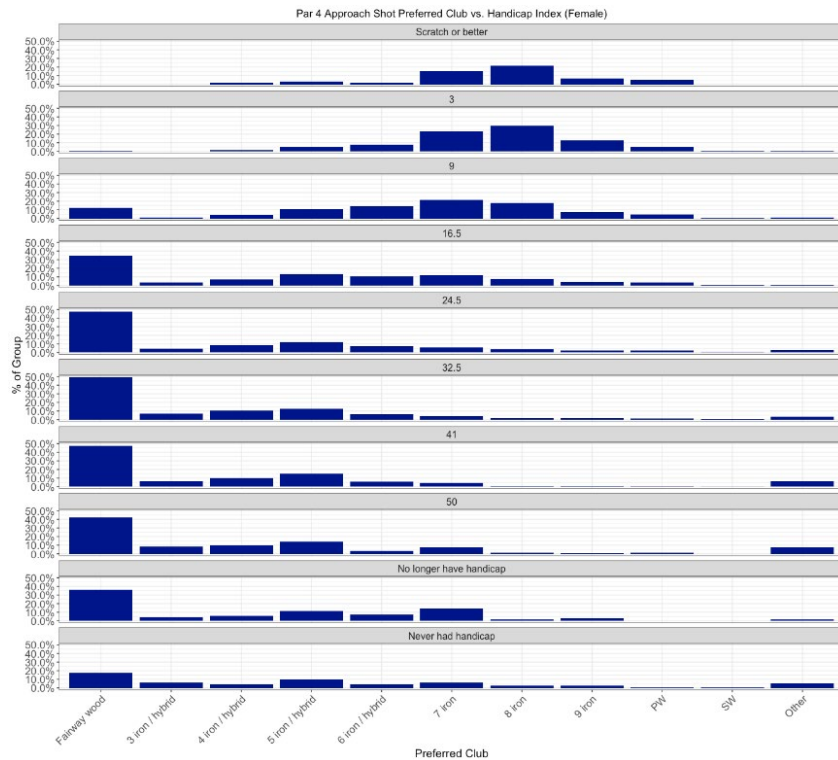
*Nearly half of least skilled female golfers that expect to hit their longest clubs (fairway wood) into greens. The trend is the same for par 3 & 5 holes.*



# Conclusions

*As skill level decreases:*

- 1. most golfers expect (prefer) to hit a longer club on an approach shot*
- 2. increasing numbers of golfers expect (prefer) to hit their longest club on an approach shot*



# Important Question

*As leaders in golf, is that what we  
want to promote?*



The cross-industry “Best Tee” initiative says “no!”

**With good shots on most holes, golfers are in the vicinity of the putting green without constantly using longer clubs on approach shots, giving more opportunities for pars and some chances for a birdie!!**



AMERICAN  
SOCIETY of  
GOLF COURSE  
ARCHITECTS



**GCSAA**  
Golf Course Superintendents Association of America



**NGCOA**  
NATIONAL GOLF COURSE OWNERS ASSOCIATION



**GCBAA**



**U.S. KIDSGOLF**  
FOUNDATION

# Putting it all together (with other work)

- An excellent way to “Grow the Game” is to reduce the number of golfers leaving
  - Hypothesis 1: golfers ultimately leave the game because they are dissatisfied with their experience
- Data shows that about 75% of female and 50% of male golfers regularly play too long a course and that their score and satisfaction suffers
  - Hypothesis 2: if golfers play a tee that best fits their game, they will generally have more fun and will be less inclined to quit playing

# Comprehensive “Best Tee” system is under development

- ✓ Best Tee infographic
- ✓ Course Playability infographic
- ✓ Facility manual and Quick Start guide
- ✓ Scorecard implementation options
- ✓ Committee Competitions Tee Selection guide
- ✓ Tee Construction guide

**USGA**  
**SCORE BETTER, PLAY FASTER**  
Use Your 7-Iron Distance to Select Your Tee

**Nicklaus Golf Club**

TOTAL 7-IRON DISTANCE (Carry and Roll Yardage)	TEES
120 or less	IV
130 - 140	III / IV Combo
145 - 155	III
155 - 160	II / III Combo
160 - 170	II
170 - 180	I / II Combo
185 or more	I



Average 7-Iron Distance (yards)	Recommended Tee	Course Length (yards)
More than 150	Gold	6800
140 - 150	Gold / Red Combo	6400
130 - 140	Red	6000
120 - 130	Red / White Combo	5600
110 - 120	White	5200
105 - 115	White / Green Combo	4800
95 - 105	Green	4400
85 - 95	Green / Blue Combo	4000
Less than 85	Blue	3600

For more information, contact Dave Pierce at [dpierce@usga.org](mailto:dpierce@usga.org) or send an email to the USGA Green Section at [golfexperience@usga.org](mailto:golfexperience@usga.org).

**NO-NAME LAKES GOLF COURSE**

*Select the best tee using 7-iron distance to have more fun!*

LIBERTY CORNER, NJ

USGA Tee Selector Example Scorecard - 2023

**NEW AND IMPROVED**

Existing Systems	New Best Tee System
Longer, hard to hit, more exaggerated clubs (driver & 5-iron)	Easier to hit, less exaggerated club (7-iron)
Linear – recommended playing length becomes very long for long hitters	Non-linear – based on golfer preferences, ability and behaviors
No adjustment – universal for all courses	Fully customized for each course
No change for Effective Playing Length factors	Can account for all EPL factors



# For more information

## Visit Golfer Experience Report Library on USGA.org

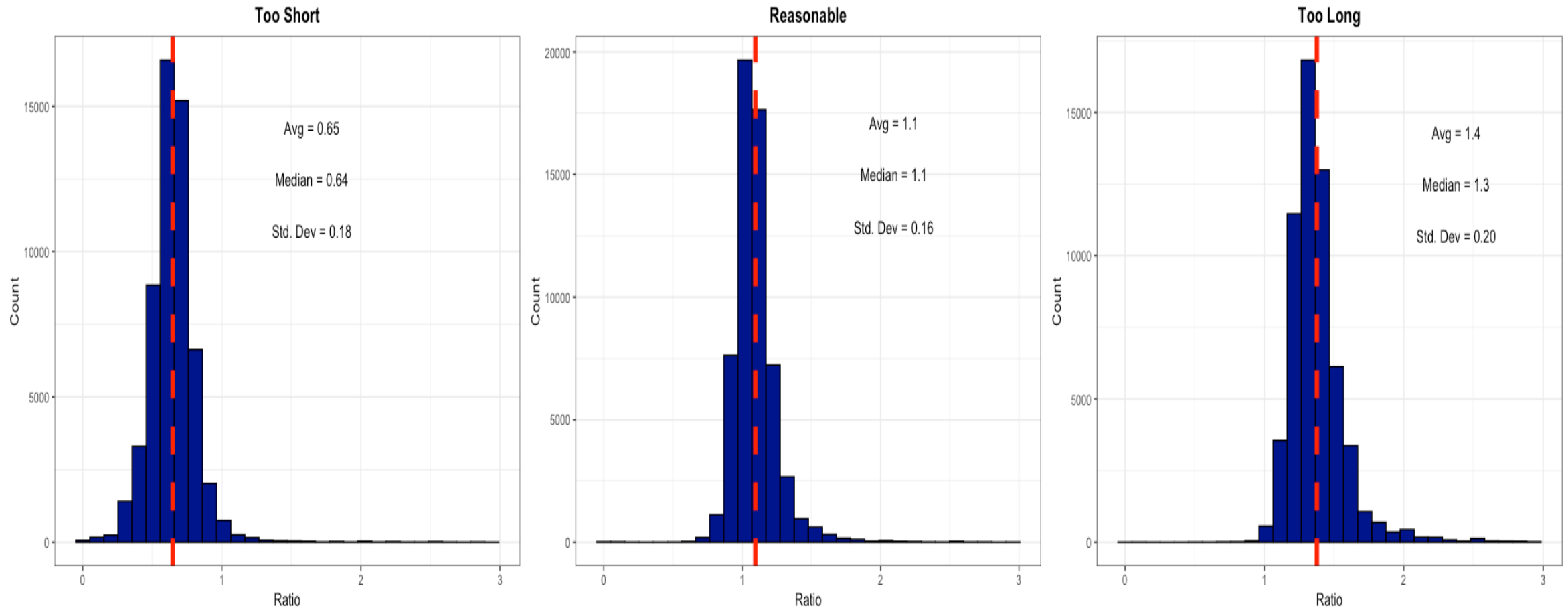
- Golfer Hitting Distance - Stated vs. Measured technical report
  - Pending – expected by the end of 2023
- Golfer Risk vs. Reward technical report
  - [Pinehurst-Penalty-Area-Golfer-Testing.pdf](#)
- Impact of Forced Carries technical report
  - [Forced-Carry-Report.pdf](#)
- Golfer Hole Length Preferences technical report
  - [USGA-SMS-Survey-Quant-Analysis.pdf](#)
- Best Tees System
  - Tee Selector article: [green-section-record/61/issue-11/helping-golfers-choose-their--best-tees--.html#issueFilters=volume-61--issue-11&returnable](#)
  - Course Playability article: pending - expected by the end of 2023

**USGA**

**FOR THE GOOD OF THE GAME.®**

# Key Results

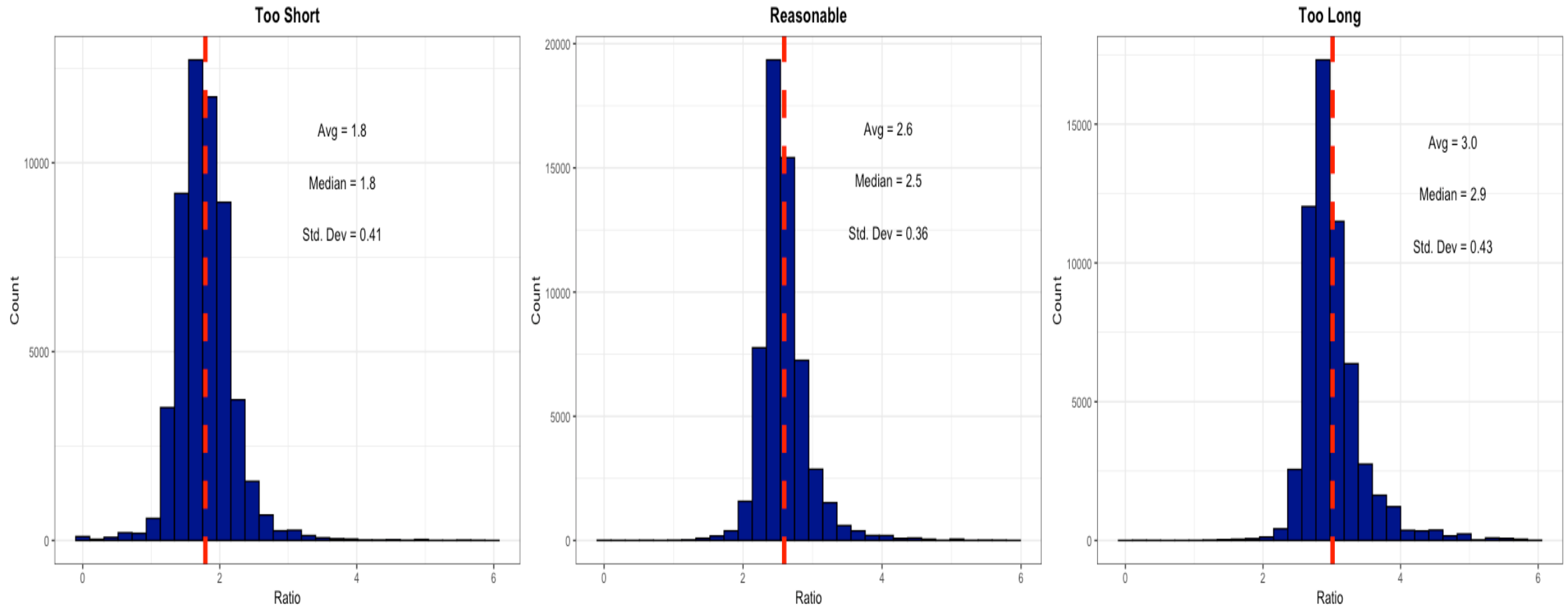
- Self-reported 7-Iron vs. Par 3 Hole Length Preference Ratios





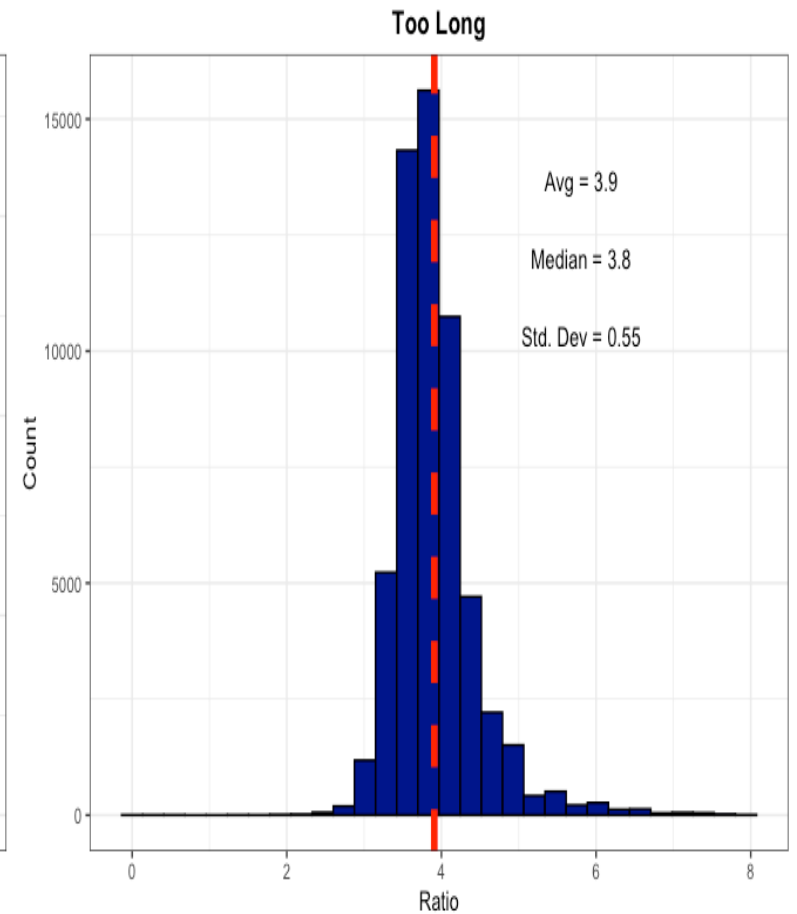
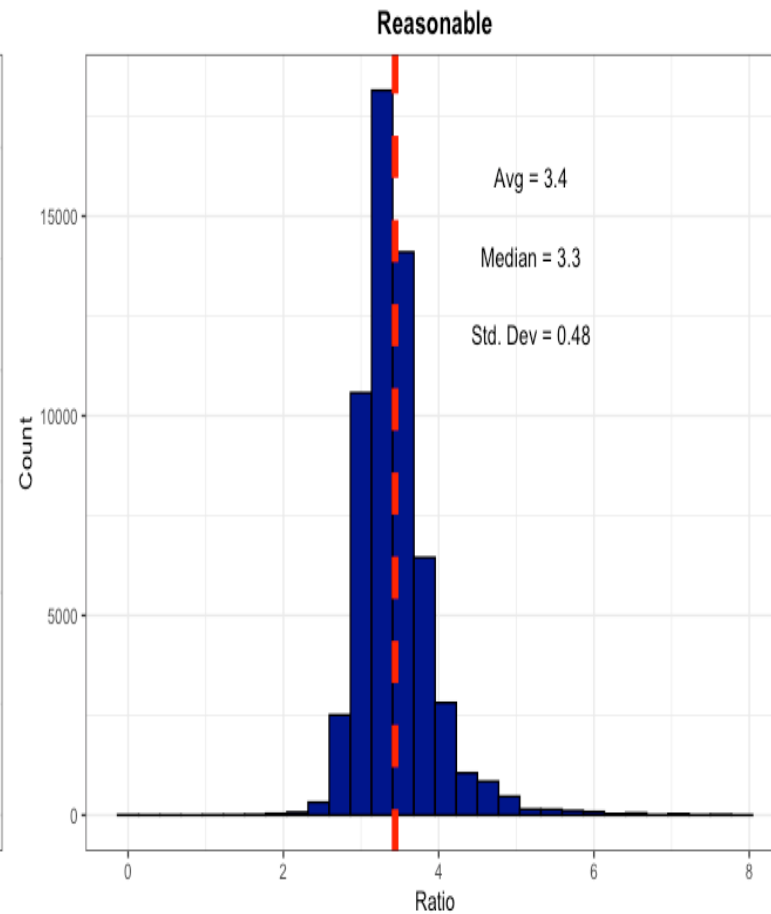
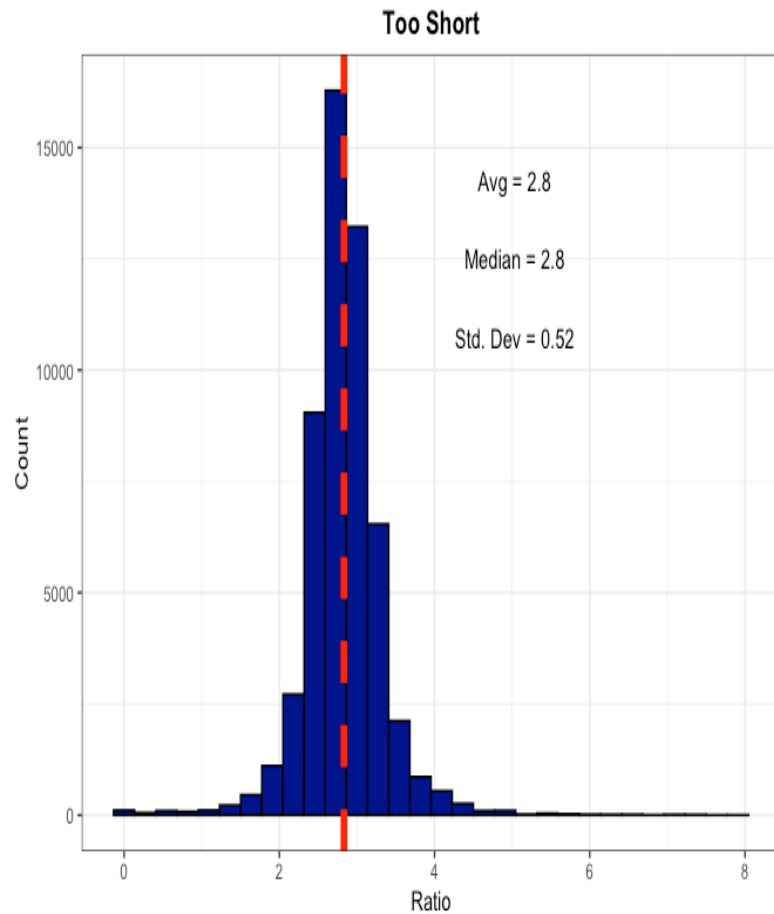
# Key Results

- Self-reported 7-Iron vs. Par 4 Hole Length Preference Ratios



# Key Results

- *Self-reported 7-Iron vs. Par 5 Hole Length Preference Ratios*



# Par 72 Template to Accommodate 97% of Golfers

Physical Tee	Orange	Green	Silver	Black	Gold
Course Length (yds)	3,600	4,400	5,200	6,000	6,800
Average Par-4 Length (yds)	208	254	300	344	393

- Combo Tees can be placed between each pair of physical tees @ ~4000, 4800, 5600 and 6400 yards.
- Three physical tees and five playing options for each gender overlapping at 5200 yards

# An Idealized, middle length, Par 4 using the template

