

# Understanding the players by how they play (Halo: Reach)



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# Overview

- Prior work & motivation
- Halo
- Our collected data
- Survey
- Description of respondents
- Friends on Halo

NOTE: Preliminary results!

# Behavioral traces

- Online behavior provides useful clues about the actors
  - Marketers use it for demographic and behavioral targeting in advertisements
  - Sites use it to improve customer experience
  - Researchers use it to understand and predict behavior

# Online behavior

- Using mobile phone data, Eagle & Pentland (2007) successfully inferred demographic data from mobility patterns
- Many studies have looked at parallels between online and offline behavior
  - Diffusion of gestures in Second Life (Bakshy et al)
  - Proxemics in Second Life (Friedman et al)
  - Development of social norms in MUDs & MOOs (Becker et al)
  - Halo 3 friendships (Xu et al)

# Halo: Reach

- Massive online first-person shooter (FPS) game played on XBox
- Campaign games, played with at most two people
- Competitive games:
  - $2 \leq N \leq 16$
  - Team games (2 v 2; 4 v 4; 8 v 8)
  - Objective games (e.g., capture the flag)
  - Free-for-all games



HUD icons: a blue box containing a shield, a rifle, and a key icon, with a blue compass rose below it.

126 Martin O'Donnell - Halo

HUD elements: the number '12', a rifle icon, and a health/ammo bar with '606' and '208' values.

CNN

Lifemaker

Major Nelson

Mini-map: a circular map showing the player's location with a yellow dot and a temperature reading of '80°F'.

Bottom right HUD: a score of '29' (blue) vs '37' (red), the date '19 June, 2009', and the time '14:03'.



# Matchmaking

- Players can join game as a group (although assignment to same team not guaranteed) or as individuals
- Assignment to teams by TrueSkill™ (Herbrich & Graepel), a Bayesian modeling framework
- Attempts to ensure *evenly matched games*
- Games start when sufficient number of players are matched to game



# Glossary

- Kills
- Deaths
- Assists
  - Player 1 greatly injures an opponent, “assisting”  
Player 2 who kills injured opponent
- Betrayal
  - Killing player on own team
- Suicide
  - Throwing yourself off a cliff

# Bungie API

- Bungie, inc. (the makers of Halo) opened an API to access information about players & games
- Currently over 350M games played
- Over 10M players from around the world
- Many enthusiastic fans

# Survey

- In addition to polling API for random game info...
- Created survey for Halo players
- Advertised through Facebook & Halo forums
- Asked respondents to recommend survey to friends

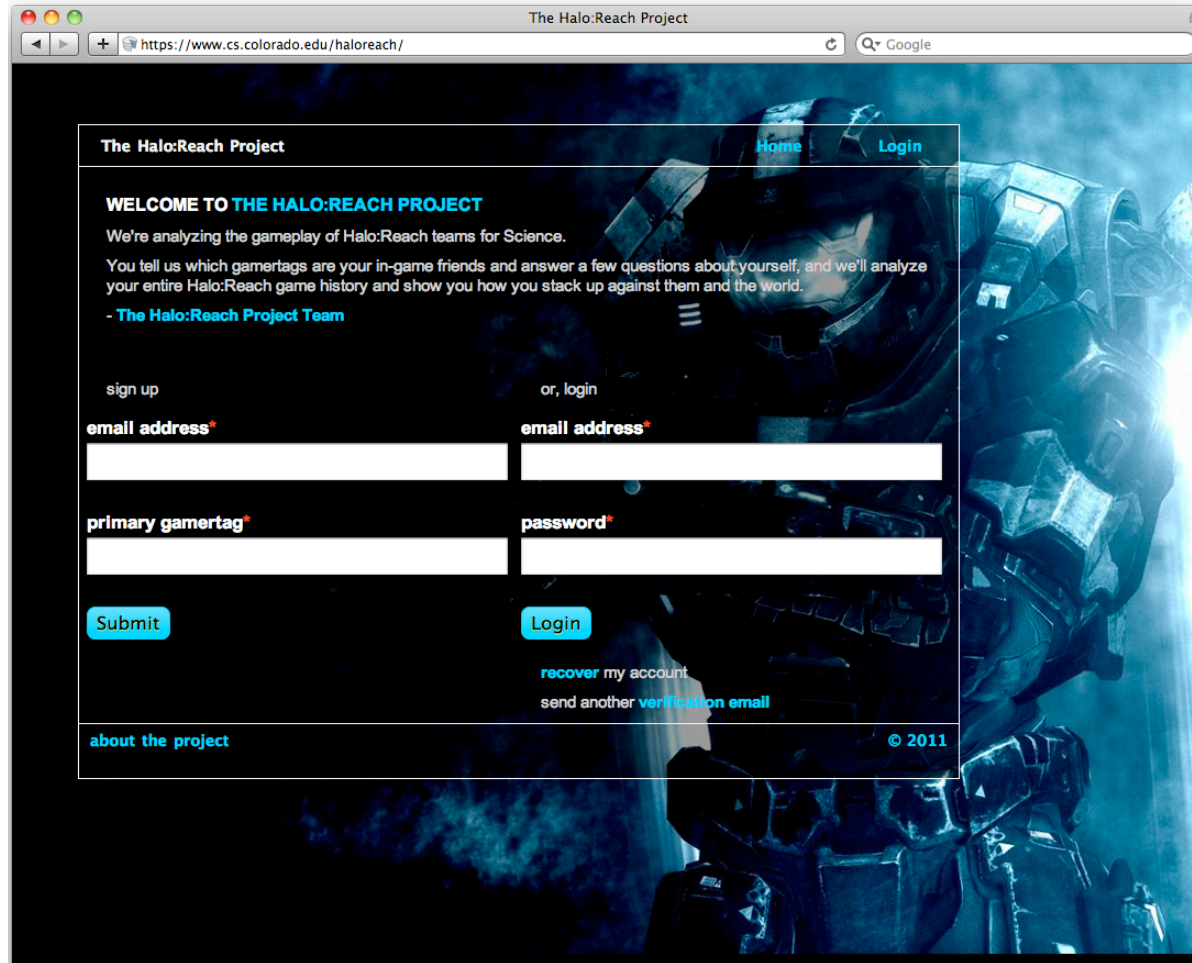
# Survey

- Demographics
  - gender, age, location (country & postal code), language, education
- Entativity
  - Psychometrics on how much they feel their team is a group
- Cohesion
  - Psychometrics on how cohesive they feel the team members are
- Conflict
  - Psychometric on how much conflict their team has

# Survey

- Leader Style
  - Whether they are / prefer to be a leader, follower, or lone wolf
- Team roles
  - Whether their team has consistent roles
- Friendships
  - Whether they made new (online / offline) friends through Halo
- Game Play
  - How often they play, what they tend to play, etc.

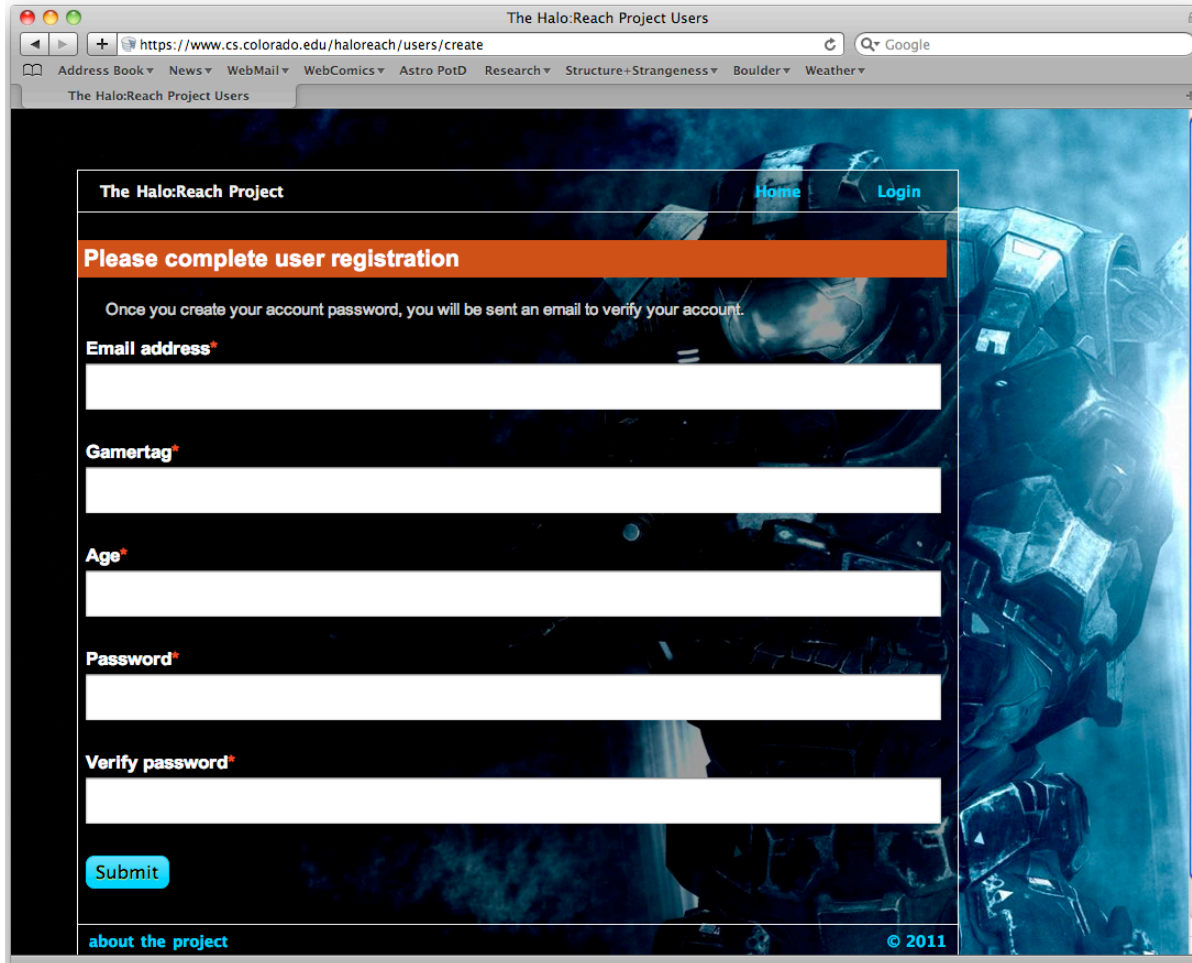
# Survey landing page



The screenshot shows a web browser window with the title "The Halo:Reach Project" and the URL "https://www.cs.colorado.edu/haloreach/". The page features a blue-tinted background image of a Halo: Reach Spartan. The main content area is a white box with the following elements:

- The Halo:Reach Project** (header)
- [Home](#) and [Login](#) (navigation links)
- WELCOME TO THE HALO:REACH PROJECT** (section header)
- We're analyzing the gameplay of Halo:Reach teams for Science.
- You tell us which gamertags are your in-game friends and answer a few questions about yourself, and we'll analyze your entire Halo:Reach game history and show you how you stack up against them and the world.
- [The Halo:Reach Project Team](#)
- Registration and login options:
  - sign up
  - or, login
  - email address\* (input field)
  - email address\* (input field)
  - primary gamertag\* (input field)
  - password\* (input field)
  - [Submit](#) button
  - [Login](#) button
  - [recover my account](#) link
  - [send another verification email](#) link
- [about the project](#) link
- © 2011 (copyright notice)

# Survey landing page 2



The Halo:Reach Project Users

Address Book News WebMail WebComics Astro PotD Research Structure+Strangeness Boulder Weather

The Halo:Reach Project Users

The Halo:Reach Project [Home](#) [Login](#)

**Please complete user registration**

Once you create your account password, you will be sent an email to verify your account.

**Email address\***

**Gamertag\***

**Age\***

**Password\***

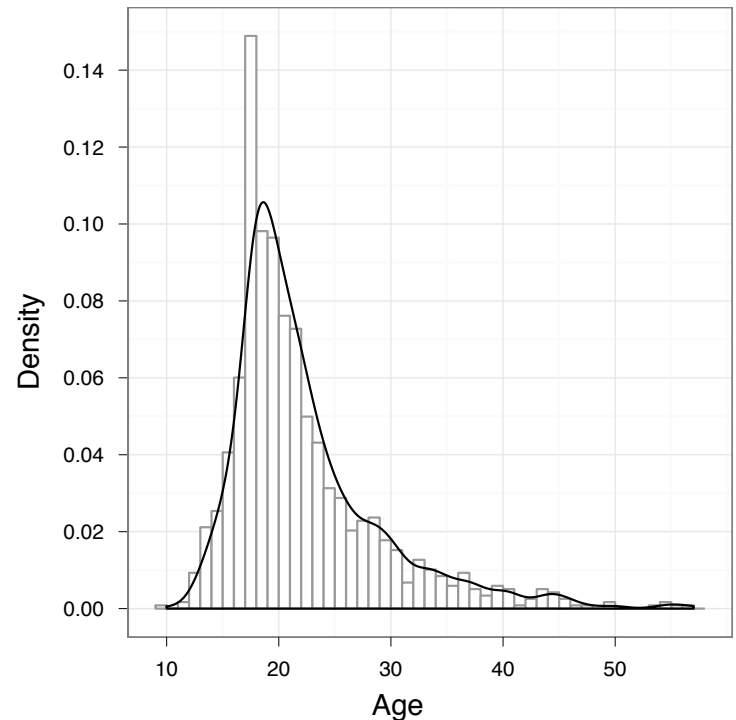
**Verify password\***

[Submit](#)

[about the project](#) © 2011

# Survey respondents

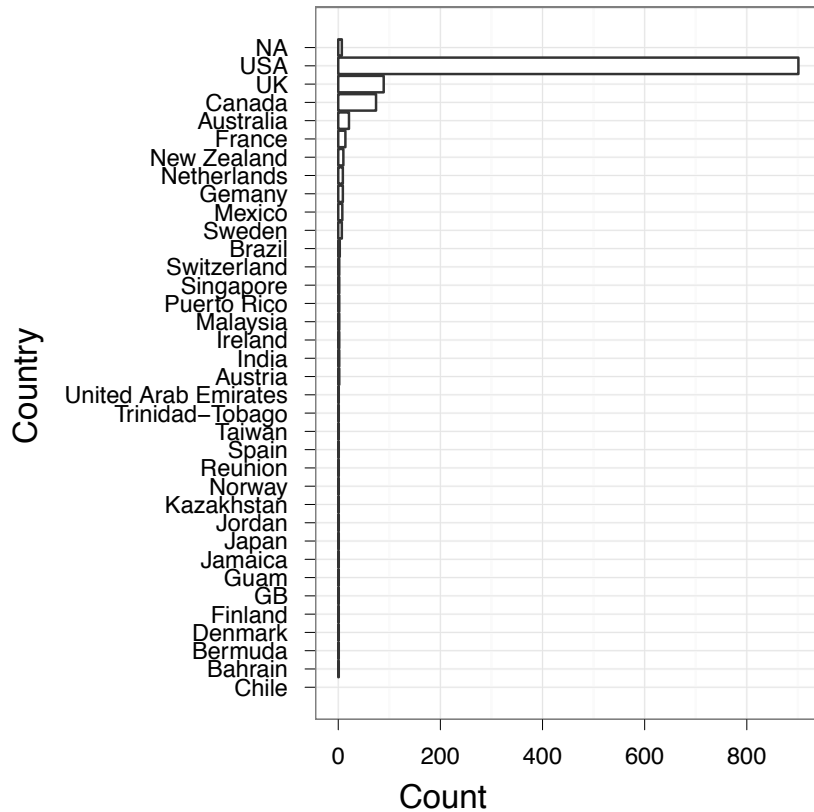
- 1182 respondents completed survey
- 99.58% reported gender; of these, 94.9% were male
- Average age: 22.4
- Median age: 20



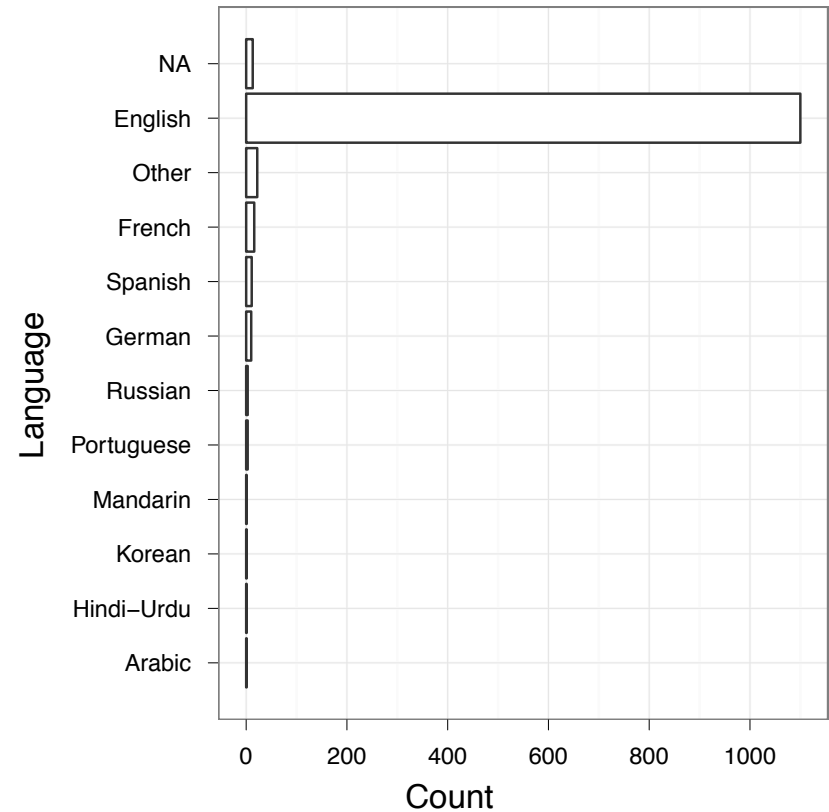


# Survey respondents

MAJORITY OF RESPONDENTS ARE FROM U.S.



LARGE MAJORITY OF RESPONDENTS SPEAK ENGLISH

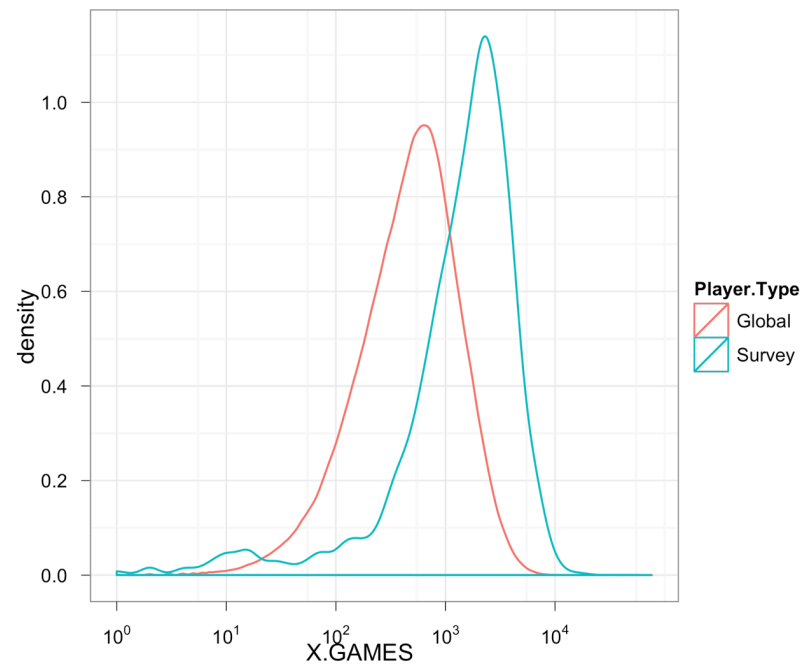


# Comparison of Survey Respondents to Typical Players

- Collected all games for random sample of 939,000 players
- Obtained all games for these players
- Provides baseline to estimate bias in survey sample

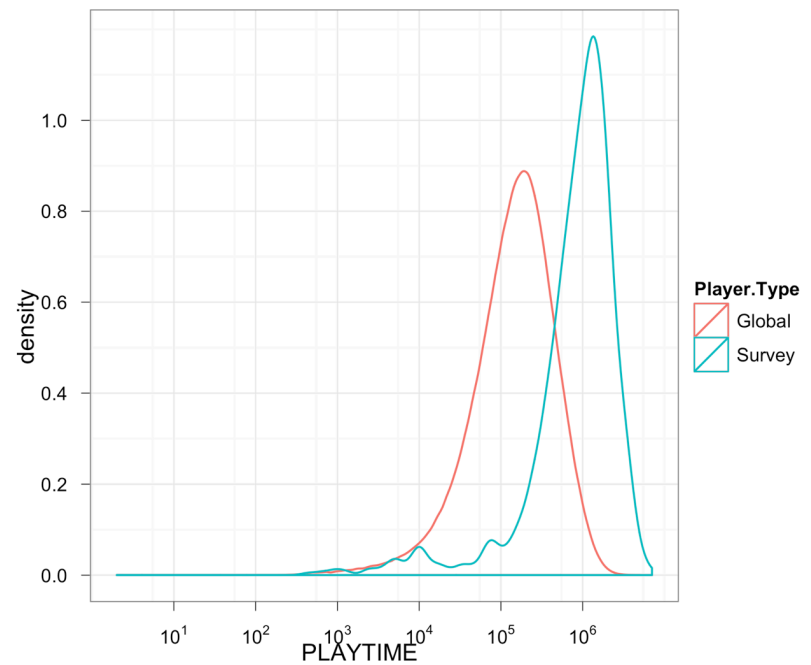
# Comparison of Survey Respondents to Typical Players

- Survey players are much more active, in number of games



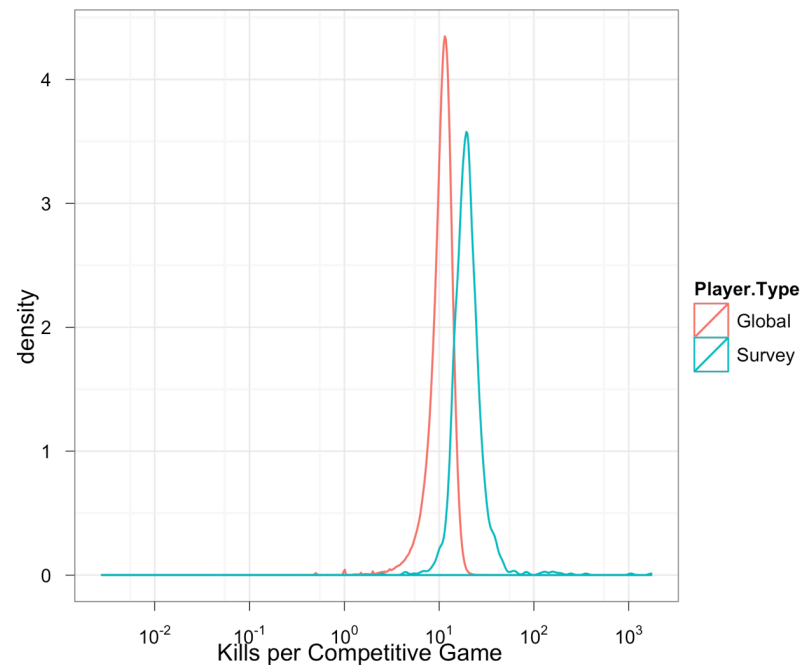
# Comparison of Survey Respondents to Typical Players

- Survey players are much more active, in number of games as well as time spent



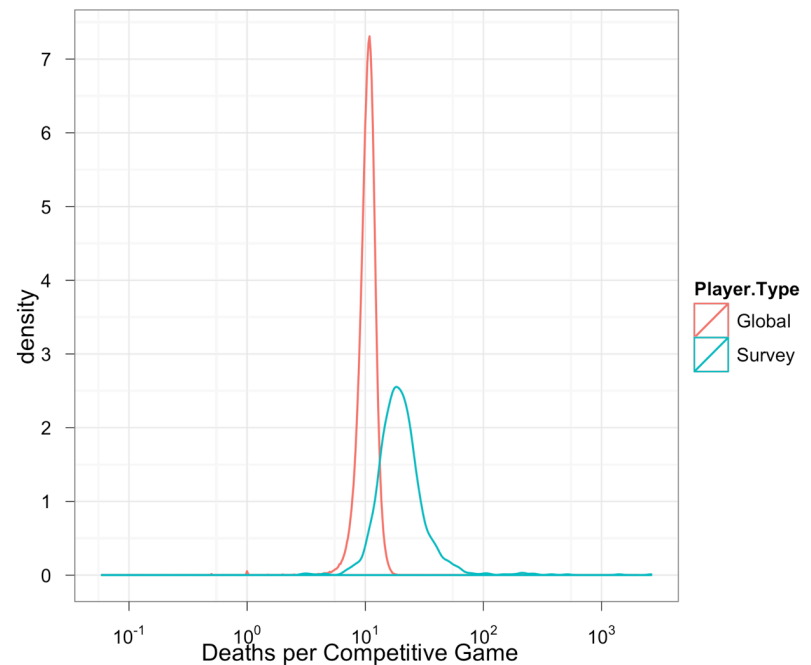
# Comparison of Survey Respondents to Typical Players

- Survey players are much more active, in number of games as well as time spent
- Survey players have more kills



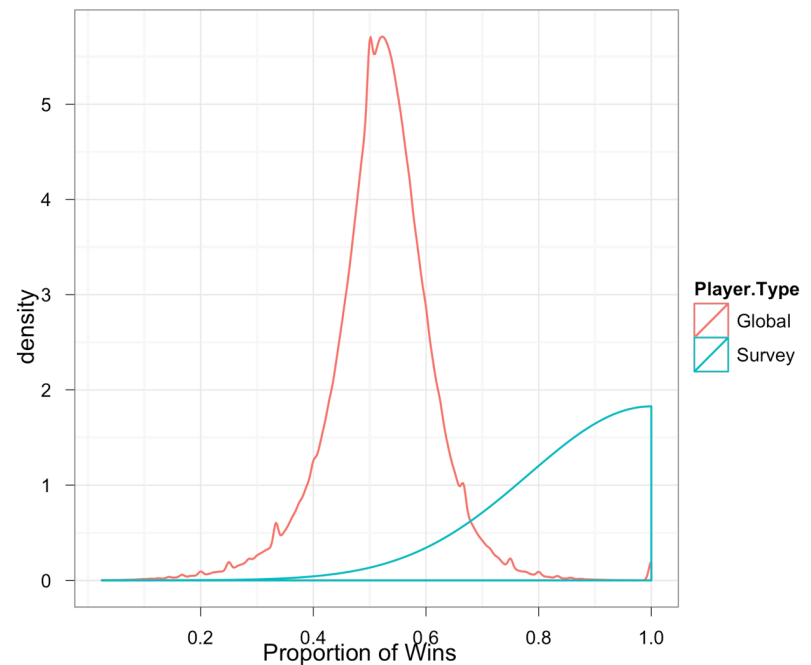
# Comparison of Survey Respondents to Typical Players

- Survey players are much more active, in number of games as well as time spent
- Survey players have more kills, but they also die more



# Comparison of Survey Respondents to Typical Players

- Survey players are much more active, in number of games as well as time spent
- Survey players have more kills, but they also die more
- Survey players are **much better at the game**



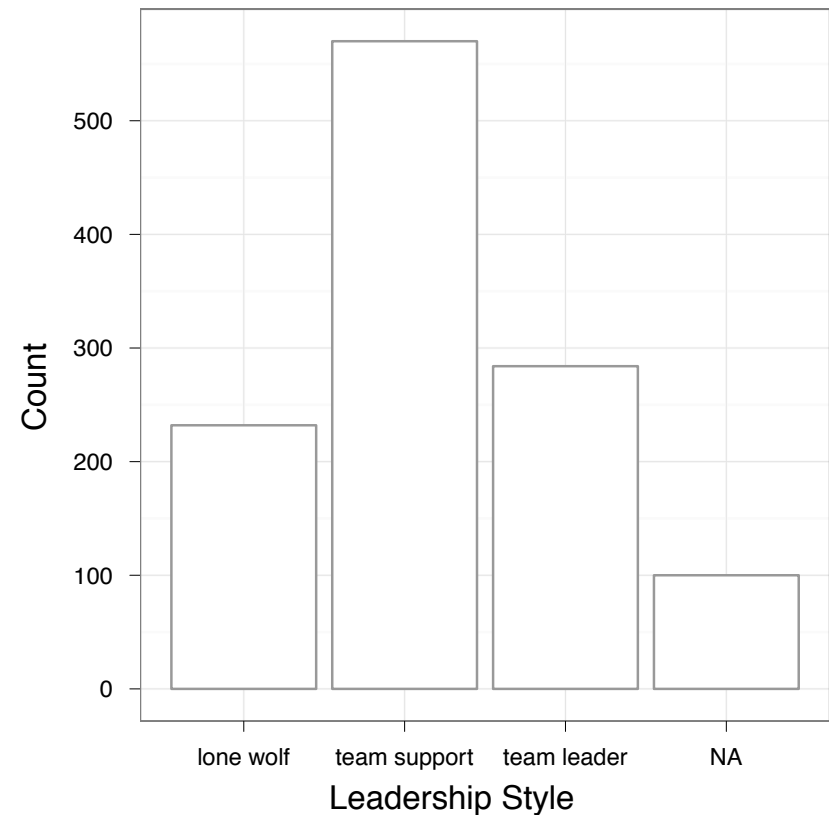
# Breakdown of Survey Responses





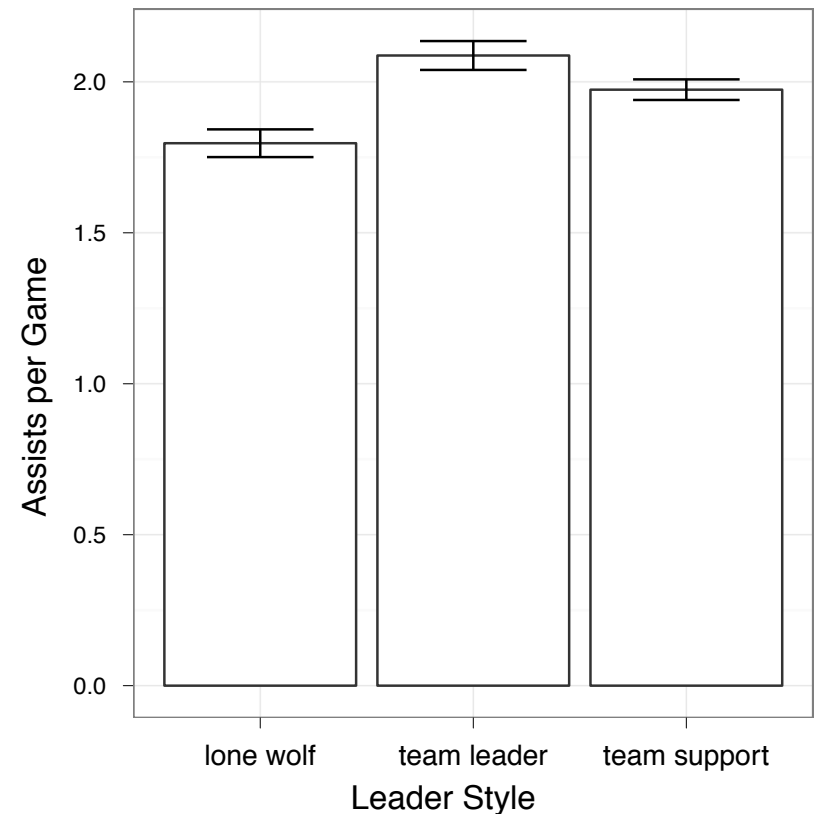
# Leader Style

- Most players prefer to play in “support” roles



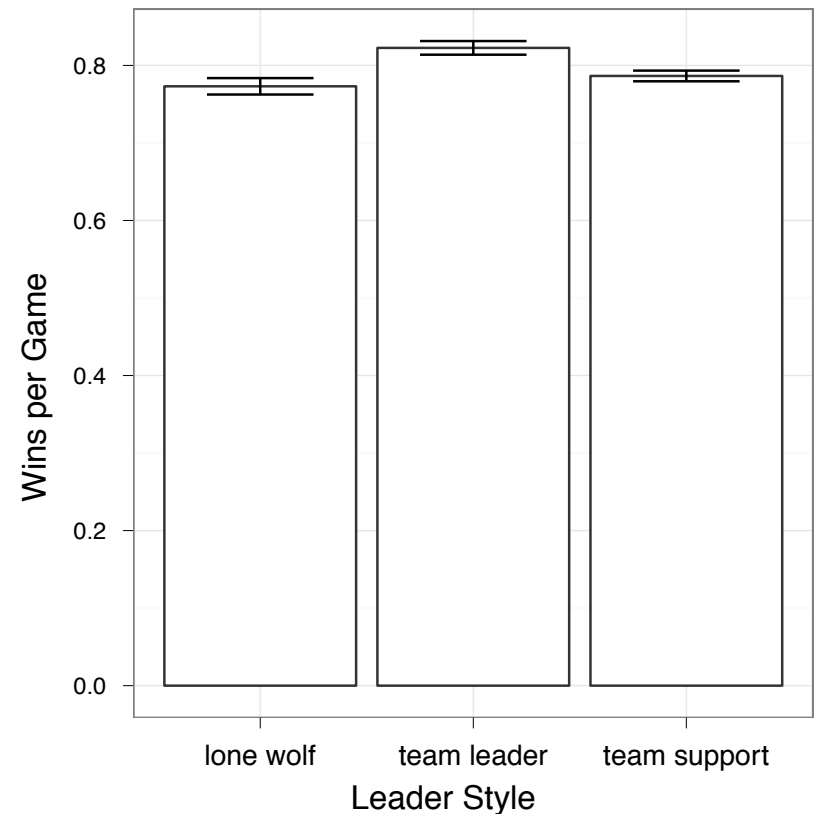
# Leader Style

- Most players prefer to play in “support” roles
- The leaders have significantly more assists, and the lone wolves have significantly fewer



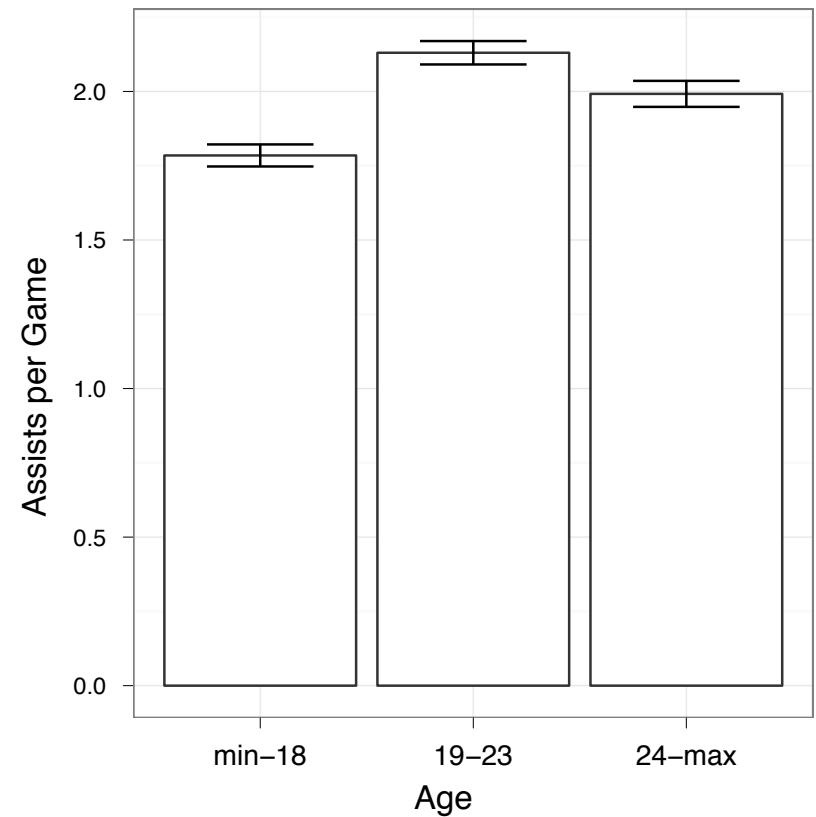
# Leader Style

- Most players prefer to play in “support” roles
- The leaders have significantly more assists, and the lone wolves have significantly fewer
- The leaders win significantly more



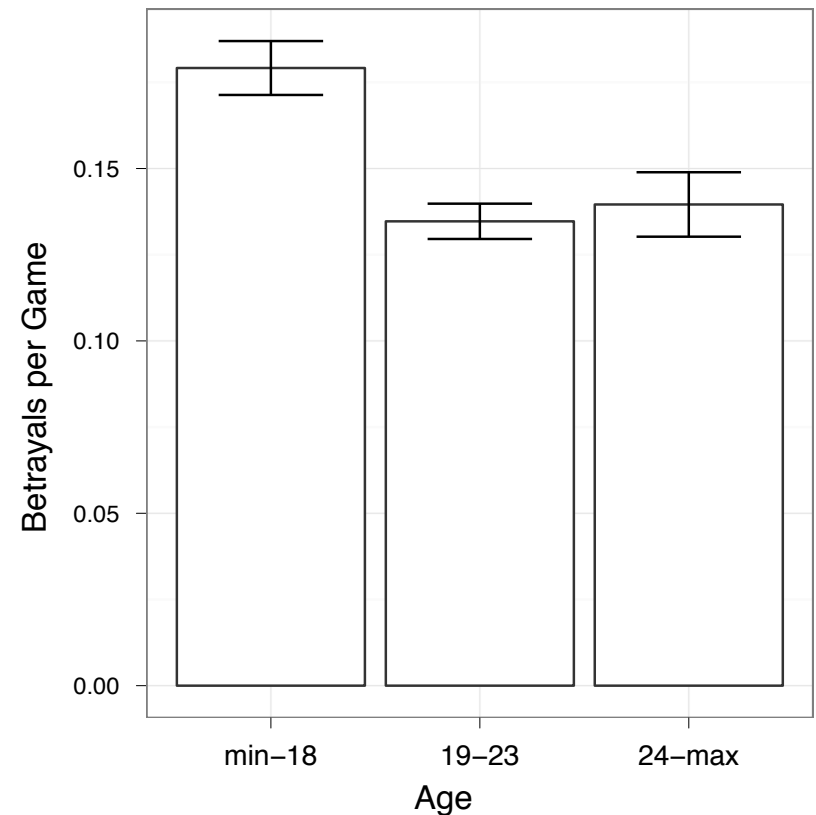
# Age

- Split age into thirds:  
10-18, 19-23, 24-57
- 19-23 year-olds assist more than other ages



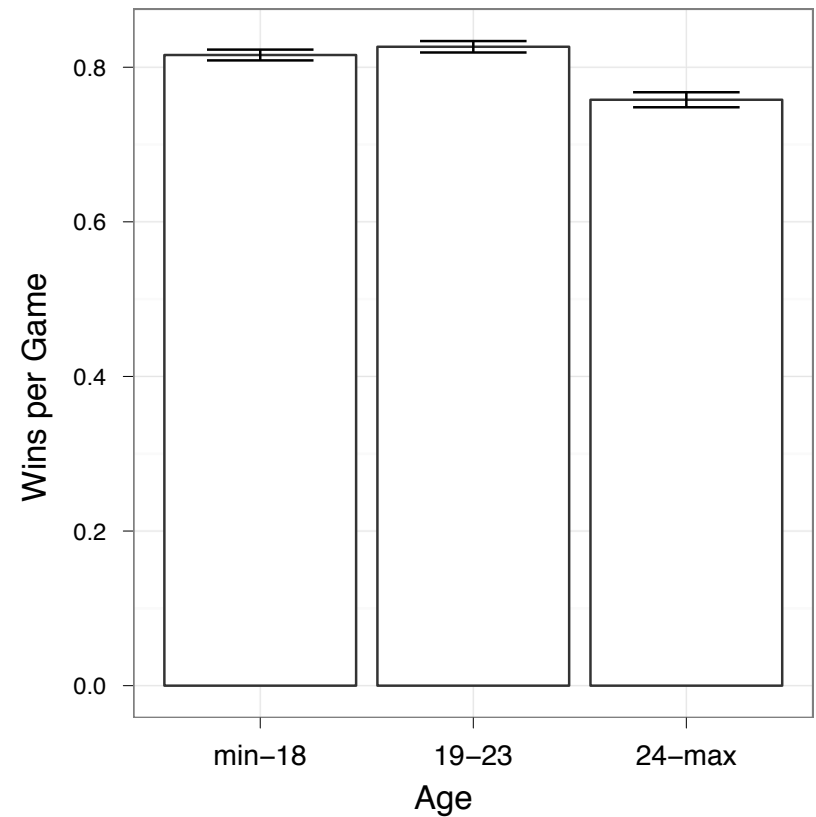
# Age

- Split age into thirds:  
10-18, 19-23, 24-57
- 19-23 year-olds assist more than other ages
- 10-18 year-olds betray their teammates more



# Age

- Split age into thirds:  
10-18, 19-23, 24-57
- 19-23 year-olds assist more than other ages
- 10-18 year-olds betray their teammates more and commit suicide more often
- 24-57 year-olds win less



# Entativity

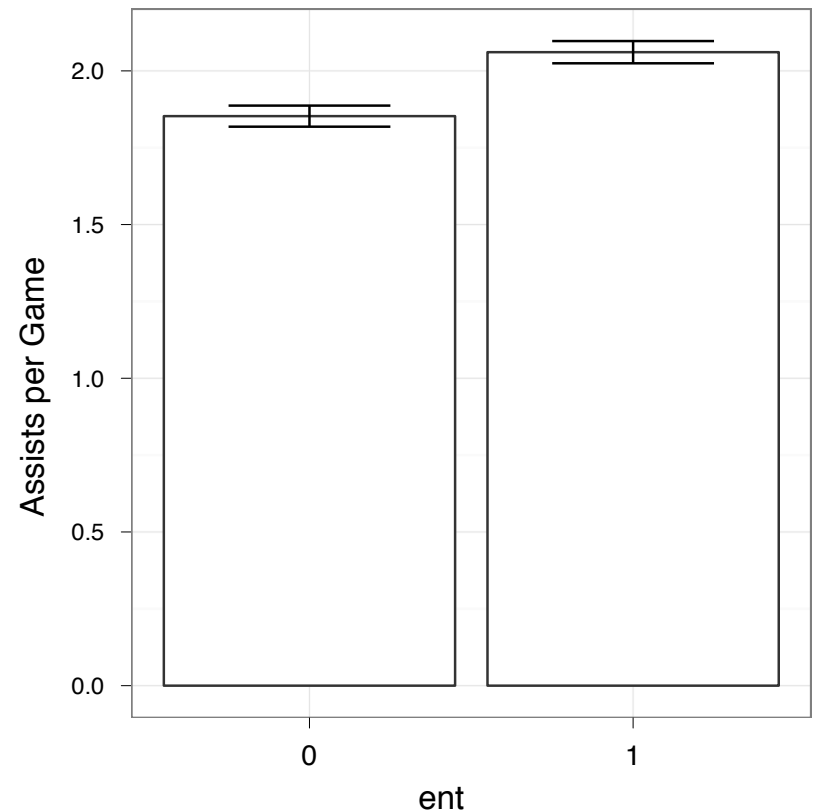
1. How tightly knit is your group?
2. How important is the group to your interest in Halo?
3. How important is winning?
4. How important is the group to winning?
5. To what extent does your group achieve its goals?
6. To what extent does your group act collectively?
7. Do you consistently work together or do your own thing?
8. Do you rely on each other for help?
9. Does your group all feel included in activities?
10. How much unity do you feel?
11. Do you talk about non-Halo topics?
12. How similar are group members to each other?
13. How much do you know about your group members?
14. How much do you like your group?





# Entativity

- Averaged correlated entativity questions
- Median split on responses (~ 4.1)
- Players who feel they are part of highly entitative groups have more assists



# Cohesion

1. Many players in my group are ideal teammates
2. I feel included in the group's activities
3. I really enjoy playing Halo with this group
4. If my group wanted to stop playing together, I would try to dissuade them
5. If I were to play a game like Halo, I would want to play with this group
6. I can play Halo the way I like with this group
7. Compared to other teams, my team is the best at working together



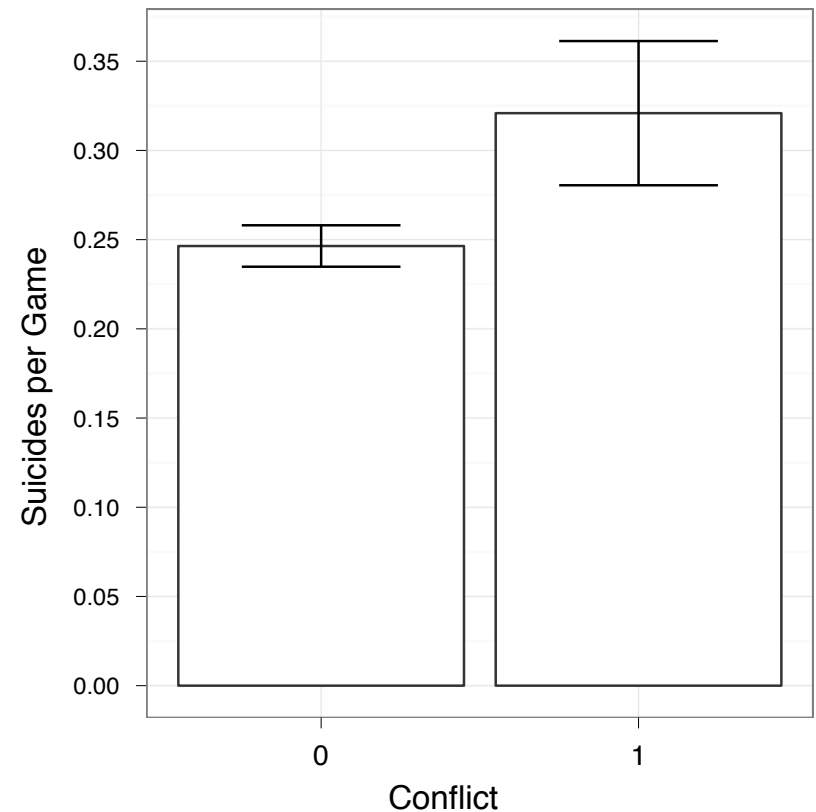
# Conflict

1. Everyone on my team gets along well
2. We have lots of arguments over who should do what job
3. The members of my group fight amongst themselves
4. Not everyone in my group gets along well
5. The members of my group are supportive of each others' plans
6. There are clashes between subgroups of my group
7. There is friendliness among the members of my group
8. There is a "we" feeling among members of my group



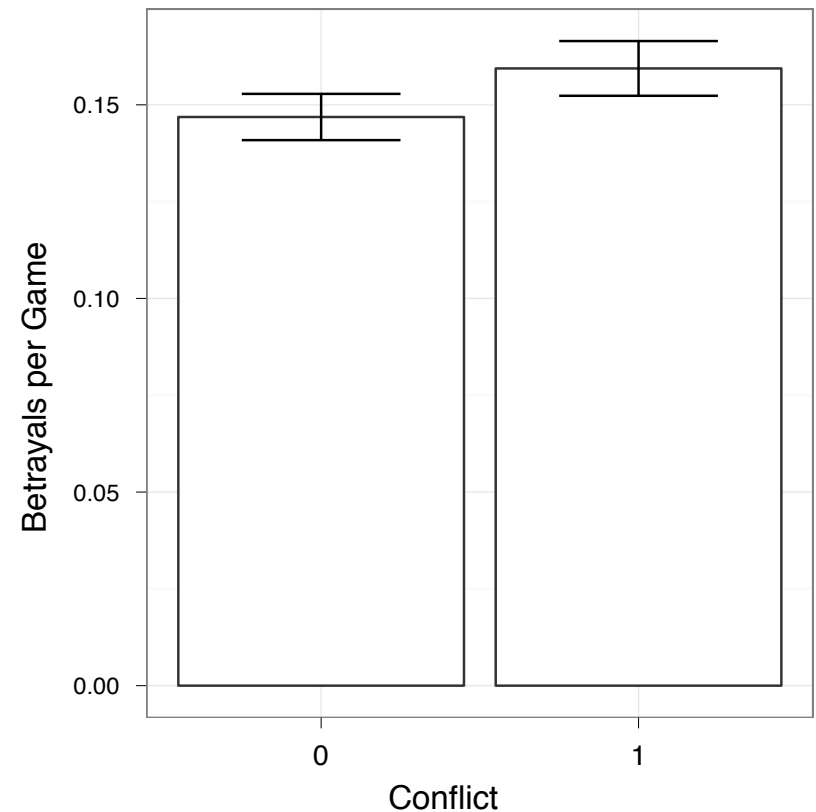
# Conflict

- Averaged correlated conflict questions
- Median split on responses (~ 1.6)
- Players who feel they are part of highly conflicted groups commit suicide more often



# Conflict

- Averaged correlated conflict questions
- Median split on responses (~ 1.6)
- Players who feel they are part of highly conflicted groups commit suicide more often and marginally more betrayals



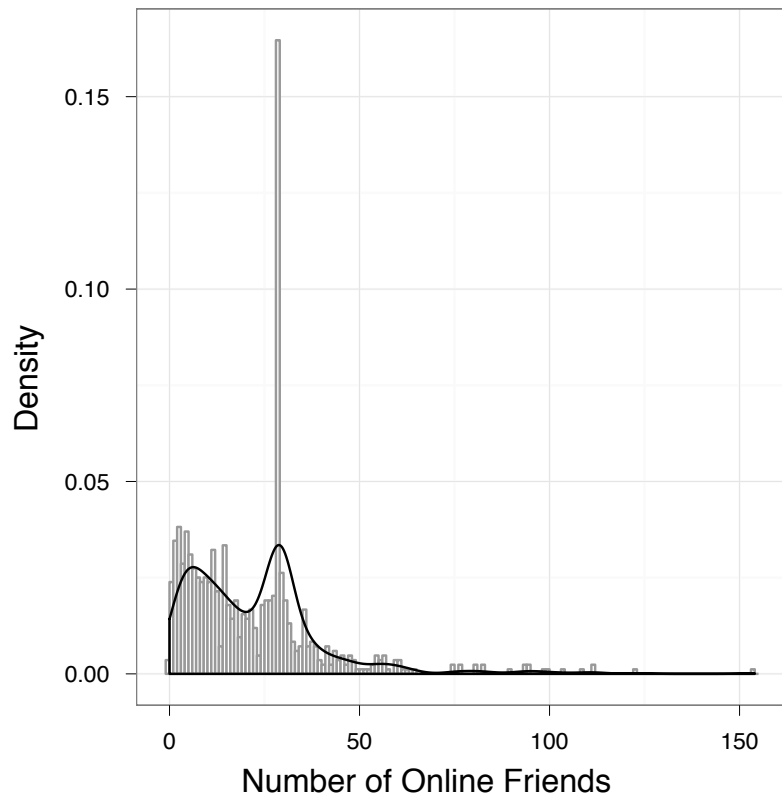
# Friends

- Players were presented with list of players they had played the most games with
- Could declare each one to be friends online and/or friends offline
- We consider game streaks—the number of games two players play together without more than  $\frac{1}{2}$  hour break

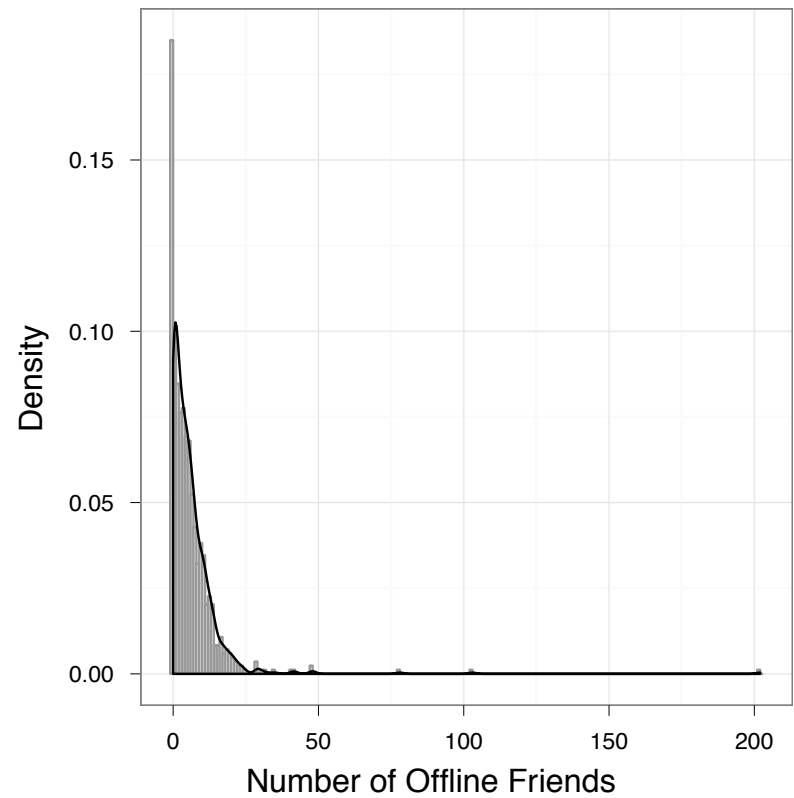


# Degree Distribution

## ONLINE FRIENDS

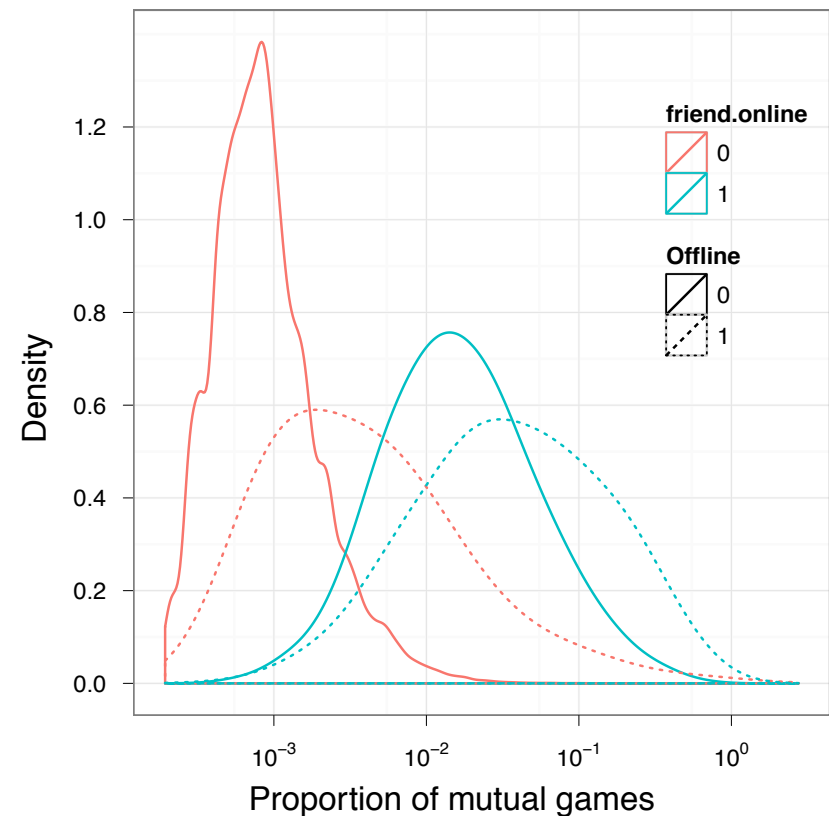


## OFFLINE FRIENDS

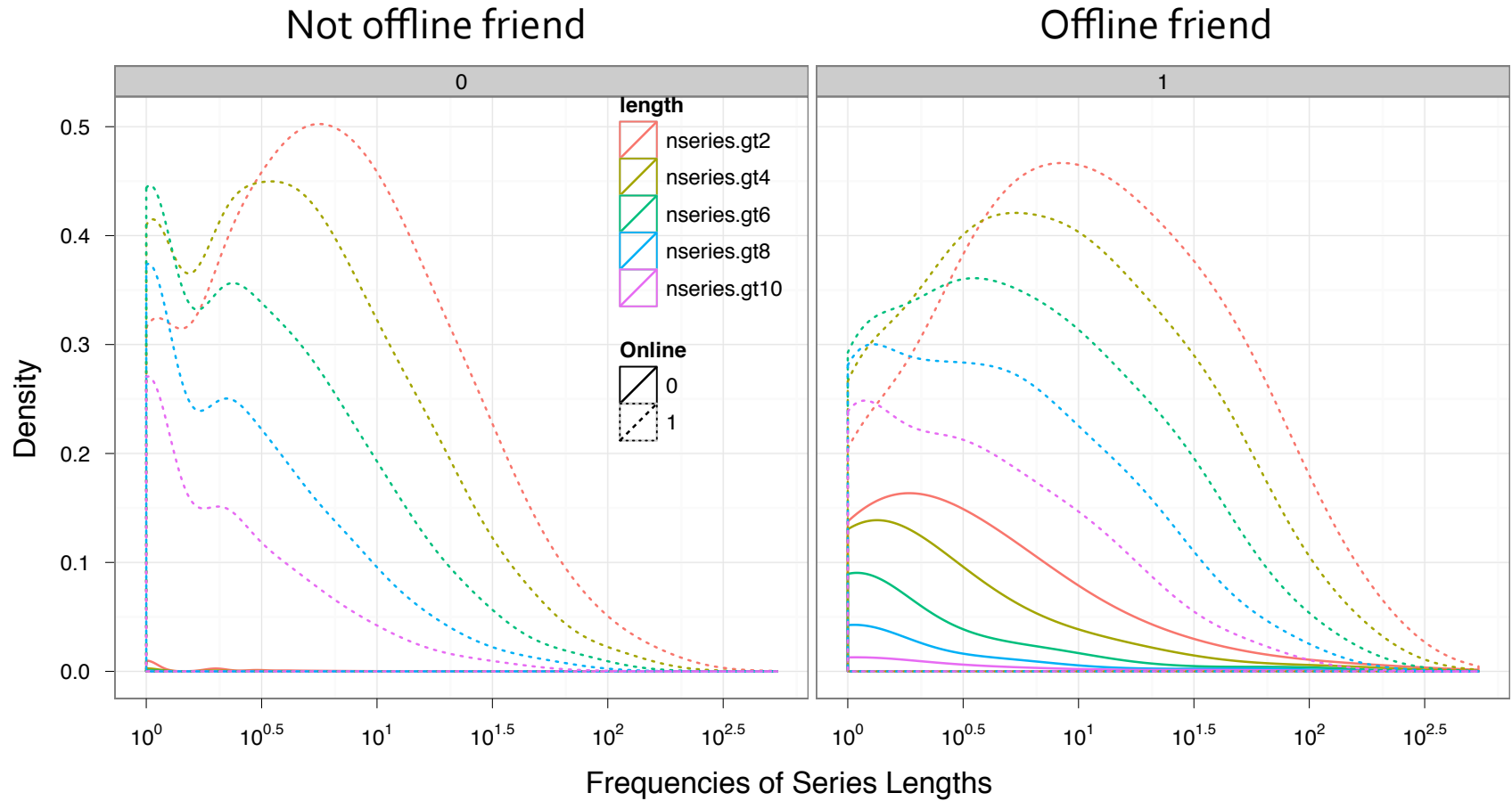


# Mutual games

- Differentiates online friends from non-friends
- Does not as successfully differentiate offline friends from non-friends



# Streak distribution



# Predicting Player Attributes

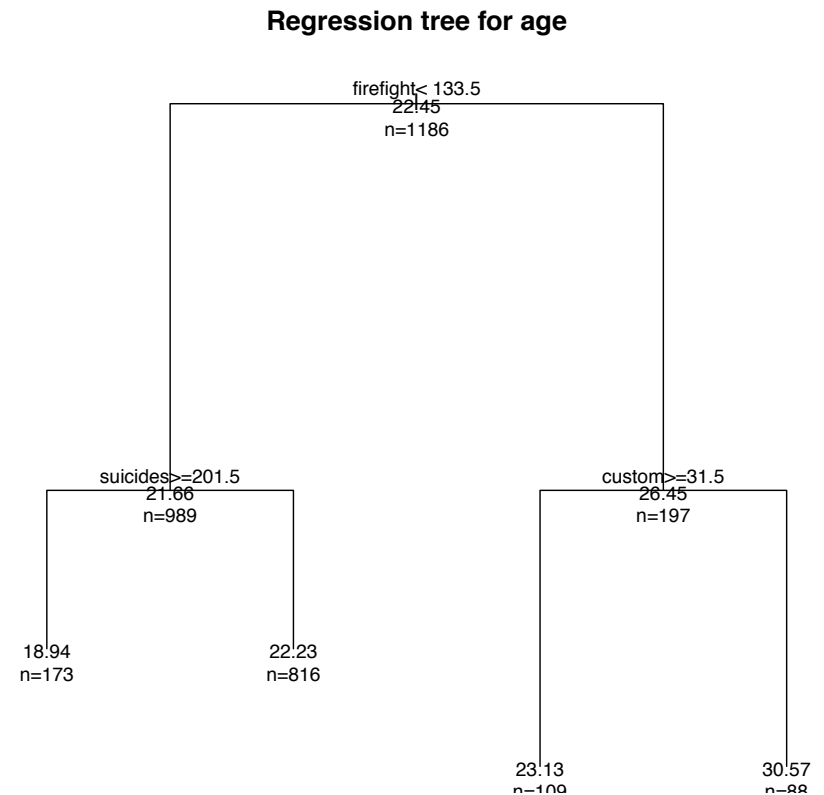
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# Predicting Age

- Tried two models:
  - Linear model
  - Regression tree
- Features:
  - Number of games of each type played
  - Kills, deaths, assists, betrayals, suicides, wins, losses

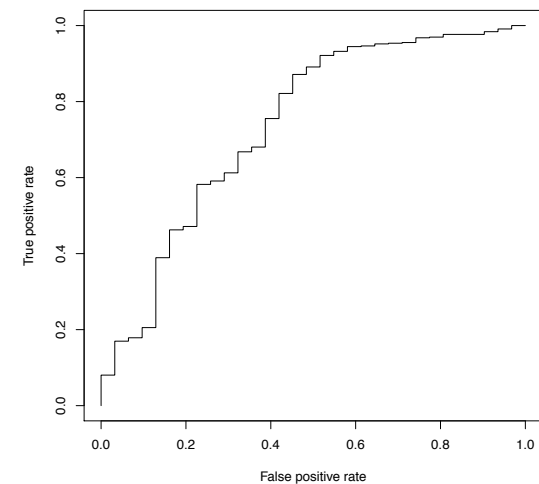
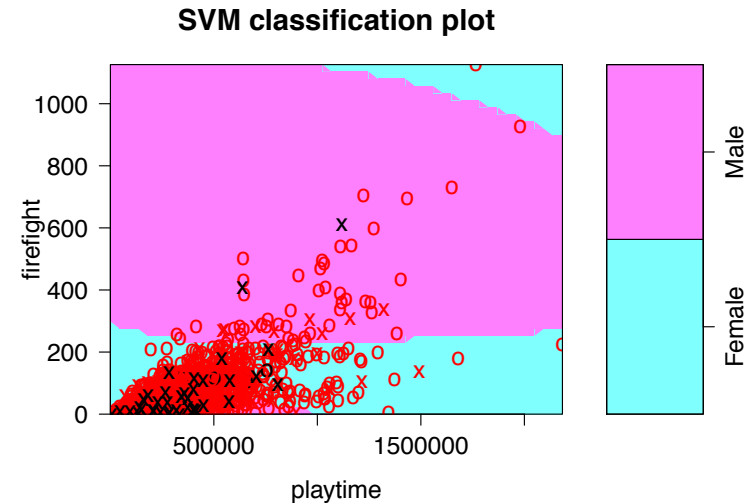
# Predicting Age

- Linear model
  - $R^2 = 0.23$
  - Key predictors are
    - Firefight
    - Headshots
    - Betrayals
    - Losses
    - Playtime
- Regression Tree
  - $R^2 = 0.19$
  - Firefight, suicides, custom



# Predicting Gender

- Logistic regression
  - Firefight
  - Wins
  - Playtime
- SVM
  - Marginal performance (AUC = 0.74)



# Predicting Leader Style

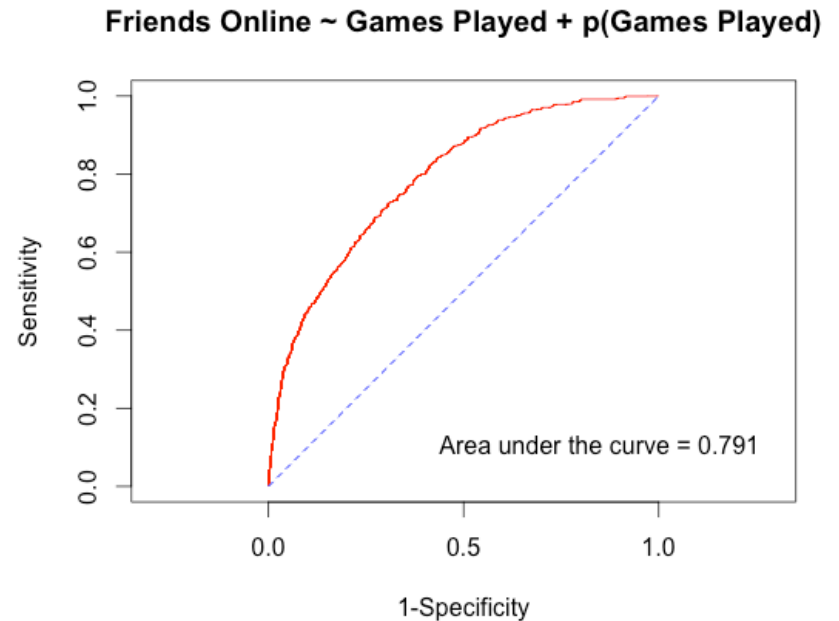
- Logistic Regression
  - Assists
  - Playtime
- SVM
  - Marginal classification accuracy
    - Diagonal = 0.5
    - Kappa = 0.13

	Lone wolf	Team leader	Team support
Lone wolf	<b>30</b>	30	40
Team leader	10	<b>32</b>	27
Team support	75	90	<b>209</b>



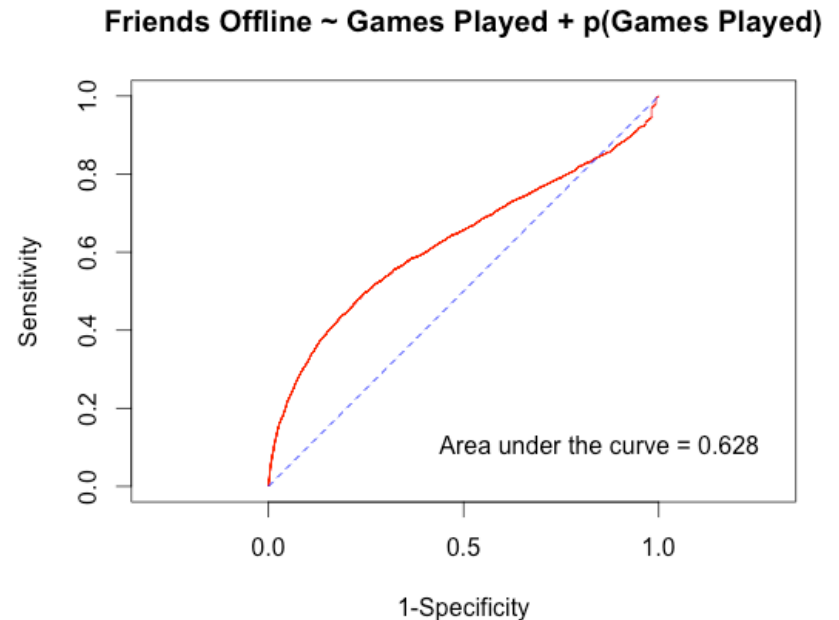
# Predicting friends

- Fair predictive accuracy for online friends



# Predicting friends

- Fair predictive accuracy for online friends
- Poor predictive accuracy for offline friends



# Future directions

- Improve current models?
- Predicting psychometric properties
  - Group cohesion
  - Group conflict
- Predicting (offline) friends
  - Additional features (e.g., campaign co-op)
  - Better model?
  - If accuracy can be improved, what are the social networks like?

# Future directions (pt. 2)

- Predicting wins & losses
  - Beat TrueSkill™
  - Leverage inferred friendships
- Identify “team” effects
  - Do players perform better with teammates than strangers?
- Identify externalities
  - Do some players help (or hurt) others who are on their team
- Do teams become more specialized?
  - Have information about weapon use. As players play together more, do they become weapons specialists?