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KNOWLEDGE FOR ACTION
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WCAI RESEARCH OPPORTUNITY

*Measuring Skill Level and Optimizing
Player-Matching Algorithms in Online Games*

A Few Operational Notes

This webinar is intended for **researchers & scholars**. It should not be published or presented without permission from WCAI.

- Questions on program: wcai-research@wharton.upenn.edu
- Press contacts: wcai-press@wharton.upenn.edu

To get access to the data, research teams should submit a proposal to WCAI and the sponsor for approval. More details at the end of this presentation.

This research opportunity is sponsored by a **major international video gaming company**. While awarded teams will be introduced, the sponsor must not be named in publications.

Please note that this dataset is very large – between 8GB-10GB.



The Components

**THE
GAME**

**THE
ROUNDS**

**THE
PLAYERS**

The Components

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The Game

- Data is collected from a single **multi-player first-person shooter** game available for console or PC.
- Play consists of **two teams** fighting against one another to achieve a certain goal, which may vary from one game mode to another, and takes place during one or more **rounds** in a dedicated virtual environment or **server**.
- Players can begin a round by choosing from two options:
 - An **“instant play”** button that drops the user into a **company-selected server**
 - Manually **choosing** their own server
- When choosing their server, players know:
 - **How crowded a server is**
 - **Whether the round will count toward their global ranking**
 - **“Rules” for a certain round**
 - **The virtual map they will play on**



Sponsor's Decision Problem

This creates an important decision problem for the company:

How should the company match players who use the “instant play” feature to a particular team on a particular server?



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As the company thinks about how to match players, they must **keep time in mind – players are unwilling to wait too long to be placed into a round. The company sticks to a **maximum wait time of 30 seconds**.**



Key Research Areas

Does a player's previous play experience relate to his future propensity to play more?

Some attributes that might contribute to a positive game experience could be, but are not limited to:

- **Preference for teamwork:** does s/he tend to play in a “supporting” role rather than an independent one?
- **Skill level:** how does being the best or worst player affect a user's gameplay? Does s/he enjoy being challenged by others? Is it important that the teams be “evenly matched”? What does “evenly matched” mean?
- **Play style of others in the round:** does s/he prefer to play alone, and has their game experience ruined by other players using team-based strategies?
- **Map preferences:** do players show preferences for certain maps?
- **Fun/Outcome:** Does having more “fun” or “winning” lead to longer play? How do you assess “fun” in this context?

The Game

- Please note that this game is **not a particularly social one**. The data does not include information about player interaction, and the instance of someone playing multiple rounds with the same people is a **rare** occurrence.
- People tend to **play independently**, so the **company is responsible for matching players** to teams and/or servers.

Generating Revenue

- Game purchase grants the user **unlimited gameplay**. Players can log on and play as many rounds as they please.
- About a third of players choose to upgrade to a premium account. This is a one-time purchase that entitles the player to:
 - **Customize their character's appearance**
 - **Priority access to busy servers**
 - **Exclusive in-game content**
 - **Ability to transfer premium membership across gaming platforms**
- Players can also purchase **servers** where they can set access restrictions and server rules.
- There will be future versions of this game, and the company hopes people who play more will purchase those versions.

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The Rounds

- A round is a **unit of game play** where at least two players are pitted against one another in combat. There are **882,000** unique rounds in the dataset.
- The primary objective of a round varies between game modes, but players generally aim to kill players on the opposing team and avoid being killed.
- The maximum number of players in a round **depends on the gaming platform**, however, **the absolute maximum is 32 players on a team at any given point.**



The Rounds

- When a player gets “killed”, she/he has the option to go back to the round and continue playing, or return to the lobby.
- Each round has a map, duration, and player count:
 - Maps have different goals and possibly different roles/functions/abilities for players
 - Duration may be as short as a few minutes or as long as several hours. The dataset includes the start time and duration in seconds.
 - Some players play the entire time, others come in late/leave early. While the maximum might be 32 players on a team at one time, the total players in the entire round may be higher. The dataset includes the maximum players allowed as well as the total player count.



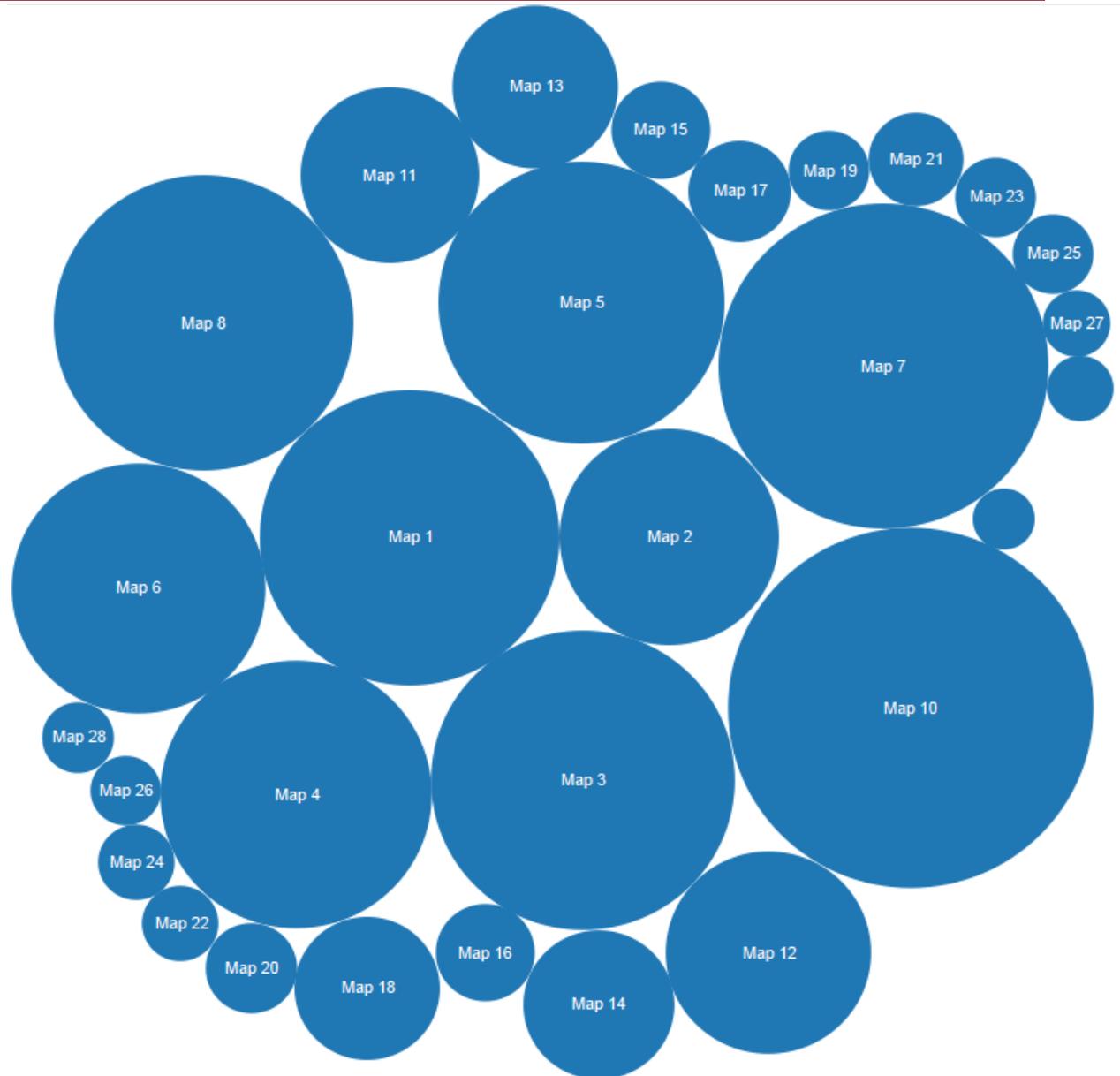
The Rounds

- The data contain **summaries** of what happened during each round. They consist of:
 - Start date and duration of completed rounds
 - All players participating in rounds (even if not for the entire duration)
 - Maximum amount of players during the round at one time
 - Total points obtained
 - Flags for players who utilize in-game roles/functions/abilities
 - Player rank/level at the start and end of the game

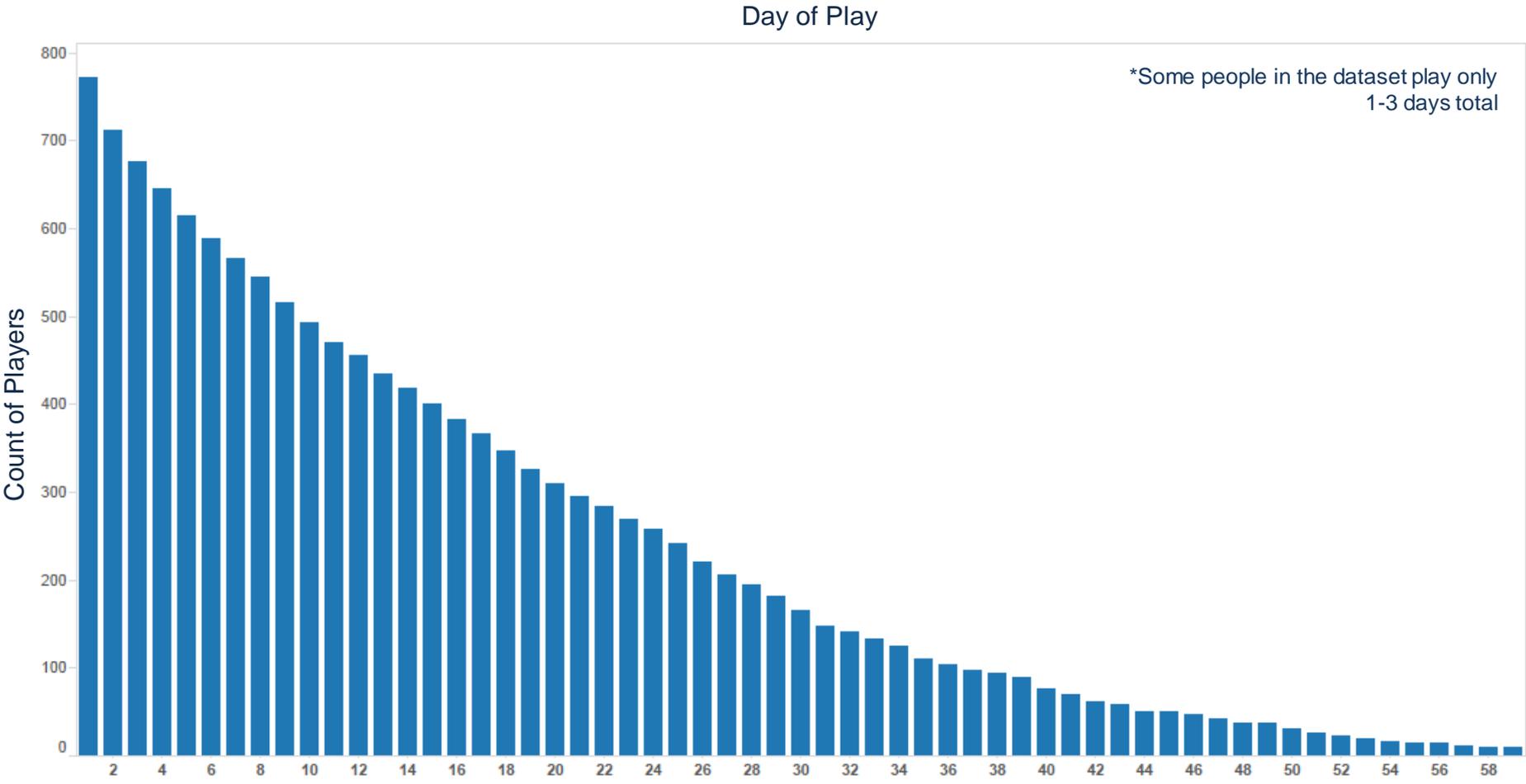
Distribution of Maps

Maps are not “leveled”, so Map 1 is not necessarily harder than Map 2.

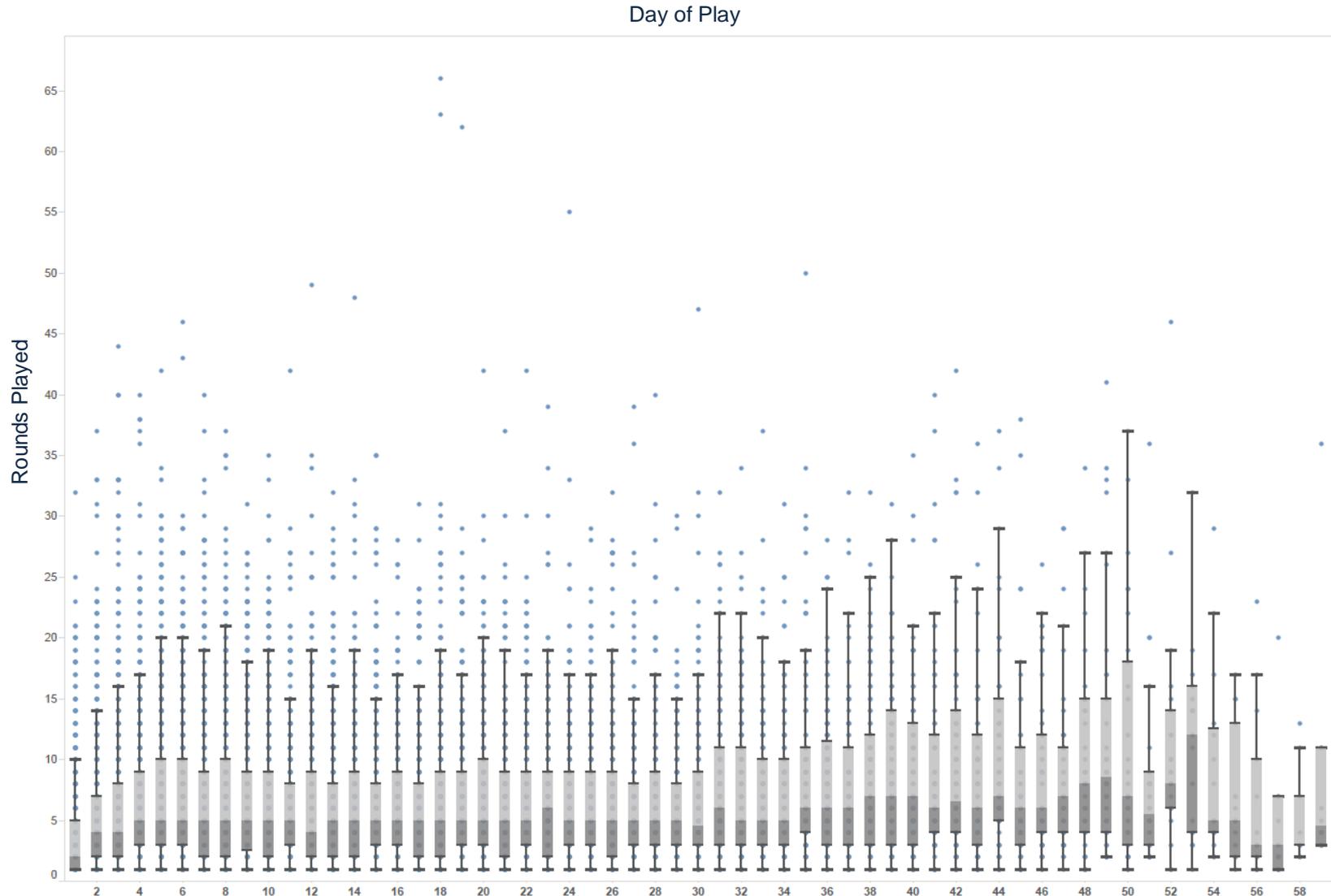
They differ on physical layout, not degree of difficulty.



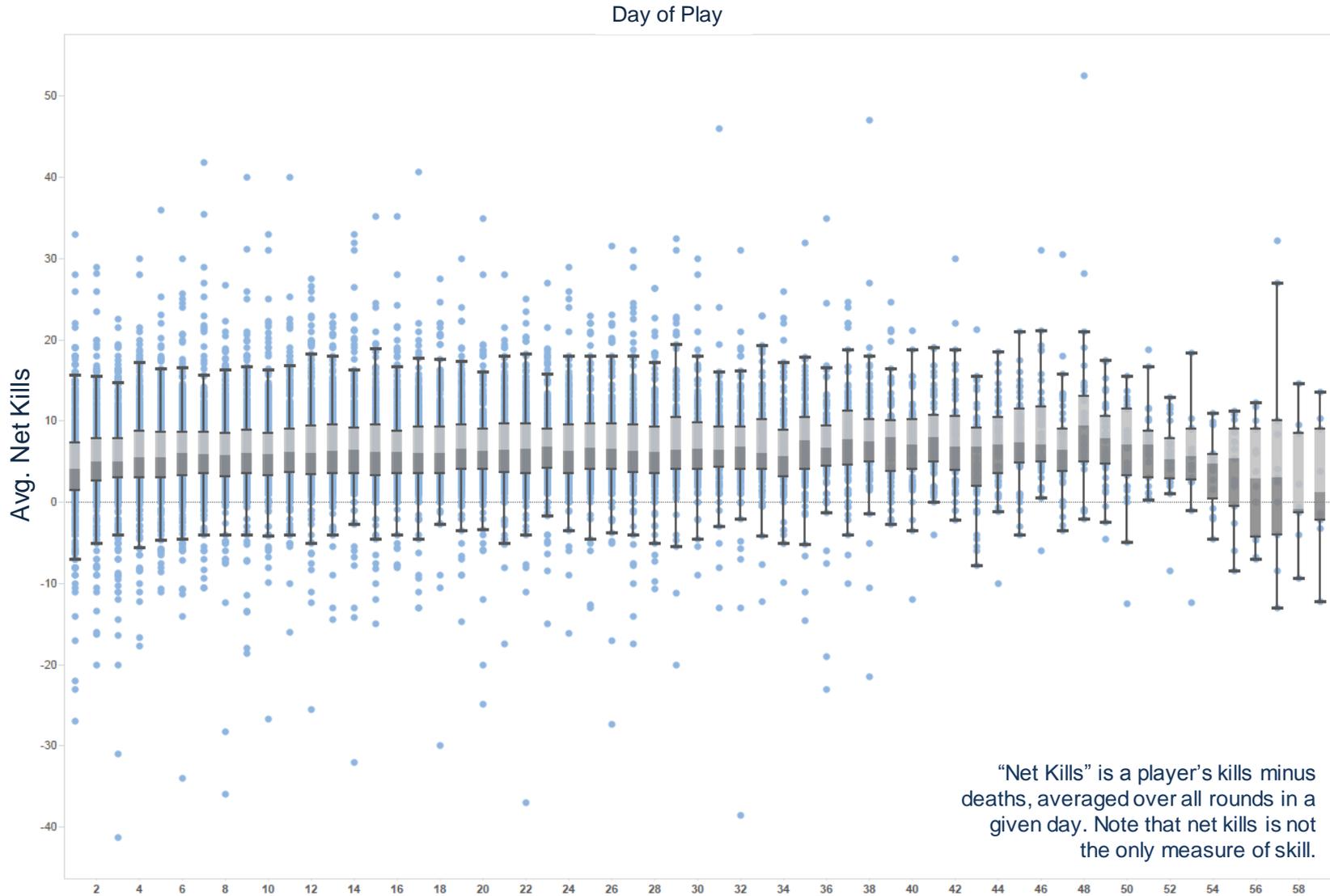
Count of Players on Nth Day of Their Play



Rounds Played per Player on Nth Day of Their Play

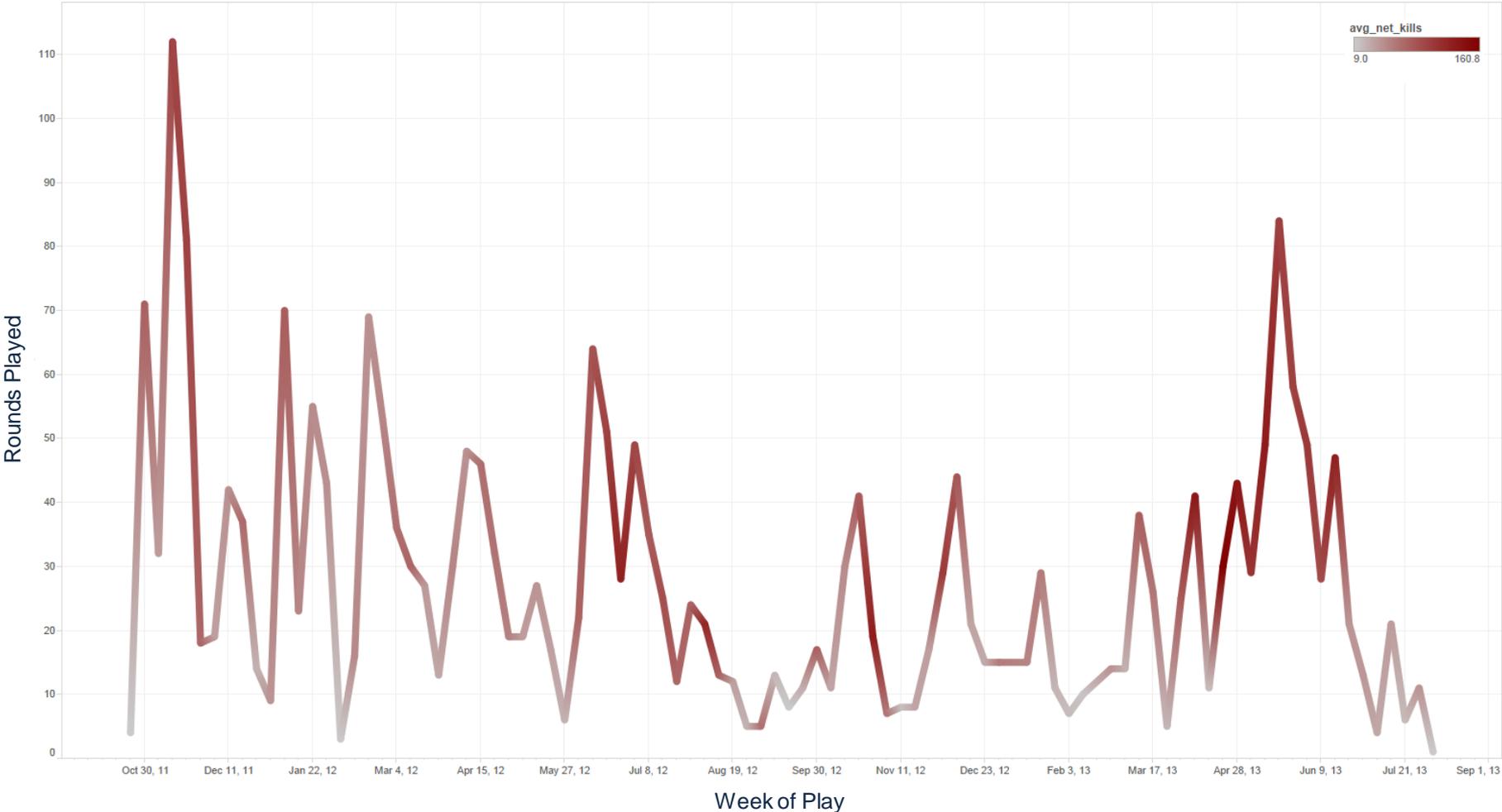


Net Kills per Player on Nth Day of Their Play



Rounds Played and Average Net Kills

for a single player



The Components

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The Players

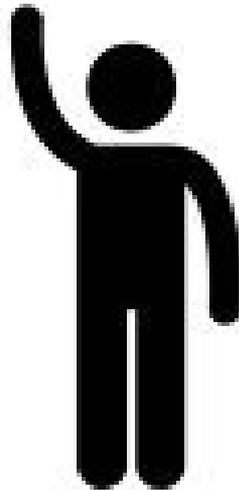
- The focal sample consists of 1,300 players who belong to two cohorts of ~650 players each:
 - Cohort 1: began playing within the first month after product launch
 - Cohort 2: began playing during a later month

The data sponsor believes that there is a big distinction between Cohort 1 and Cohort 2 regarding behavior and purchasing habits

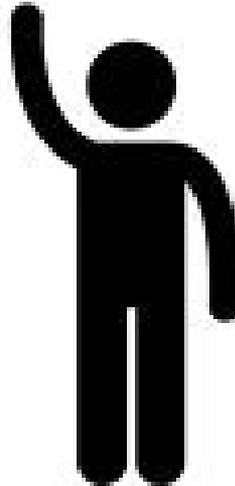
- The dataset covers all rounds played by these players for 18 months.



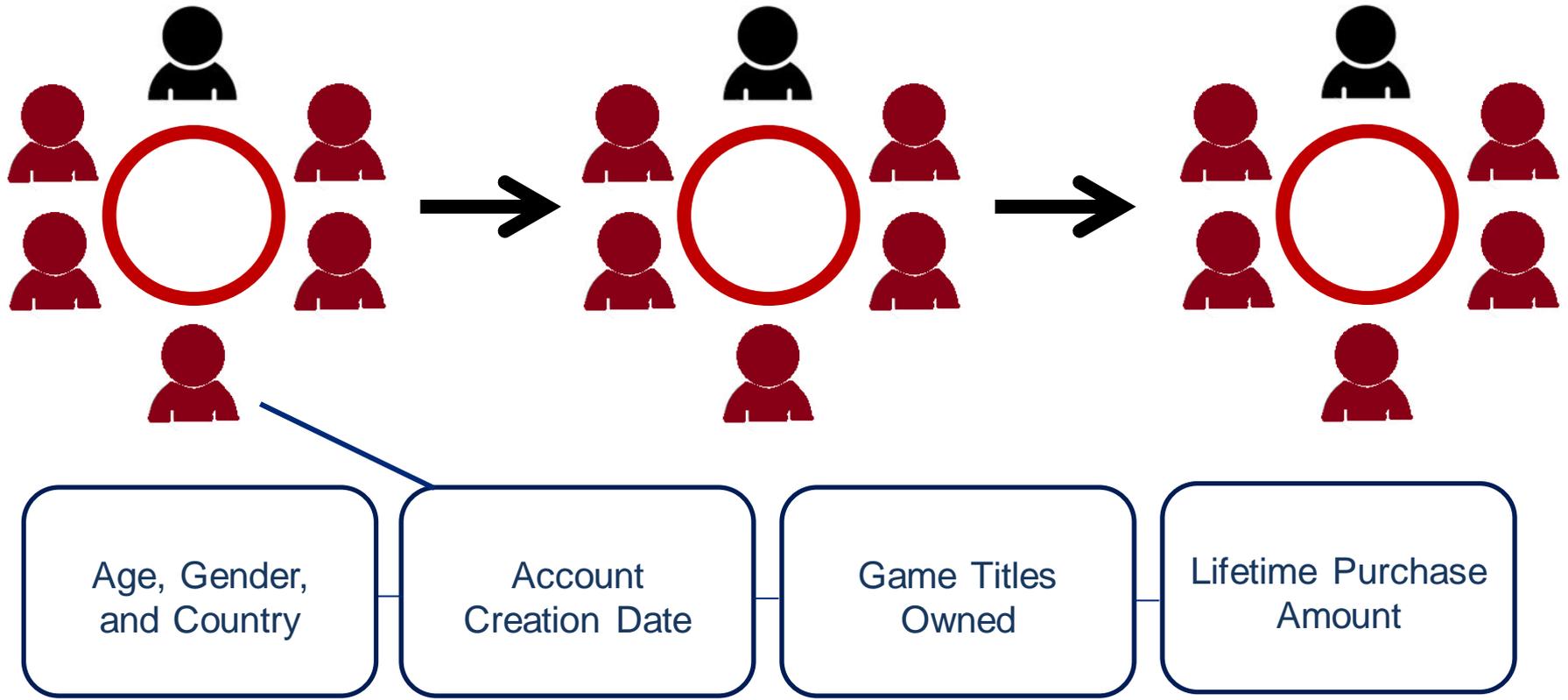
Andrew is a player in our focal sample. We know some **basic information** and **historic behavioral data** about him, such as:



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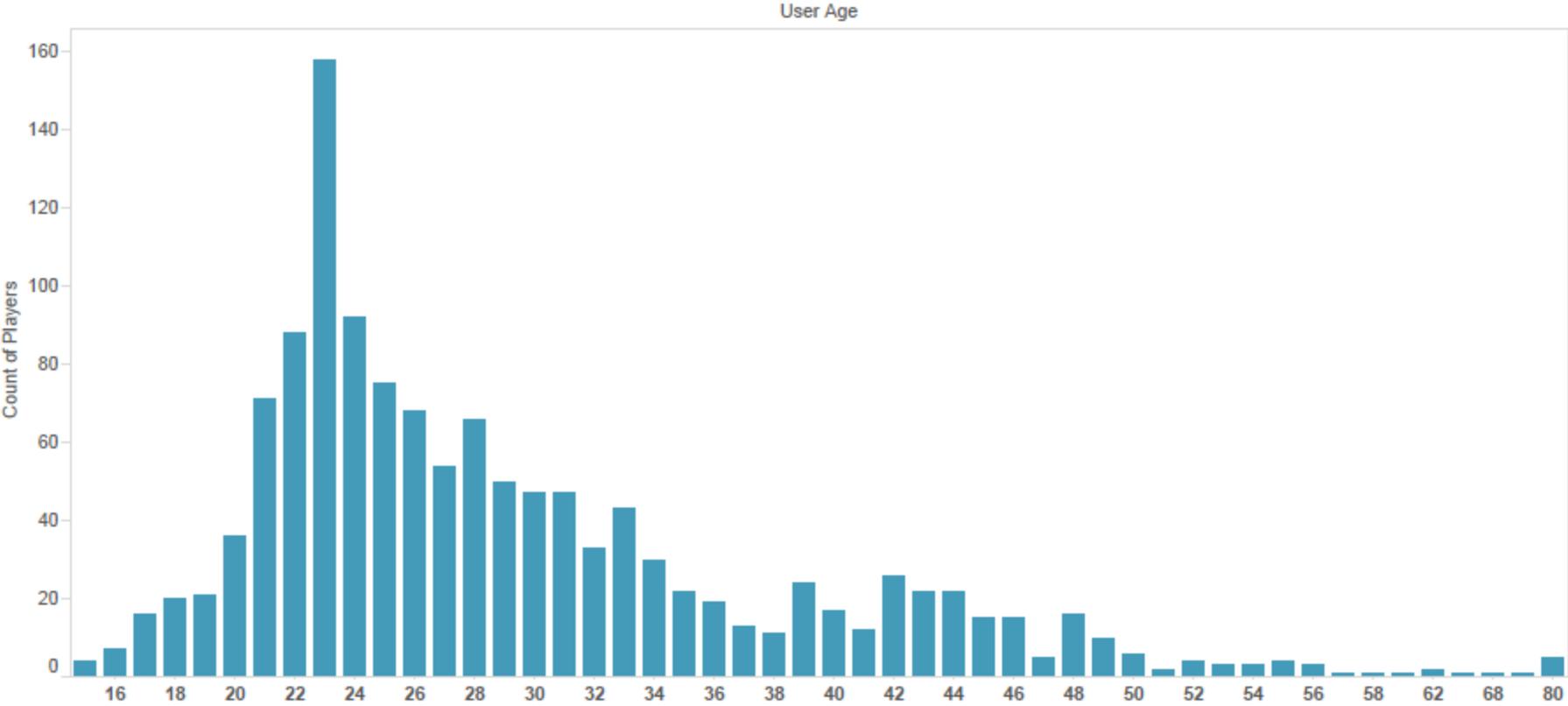
We also have historical behavioral data for each user that Andrew played a round with.



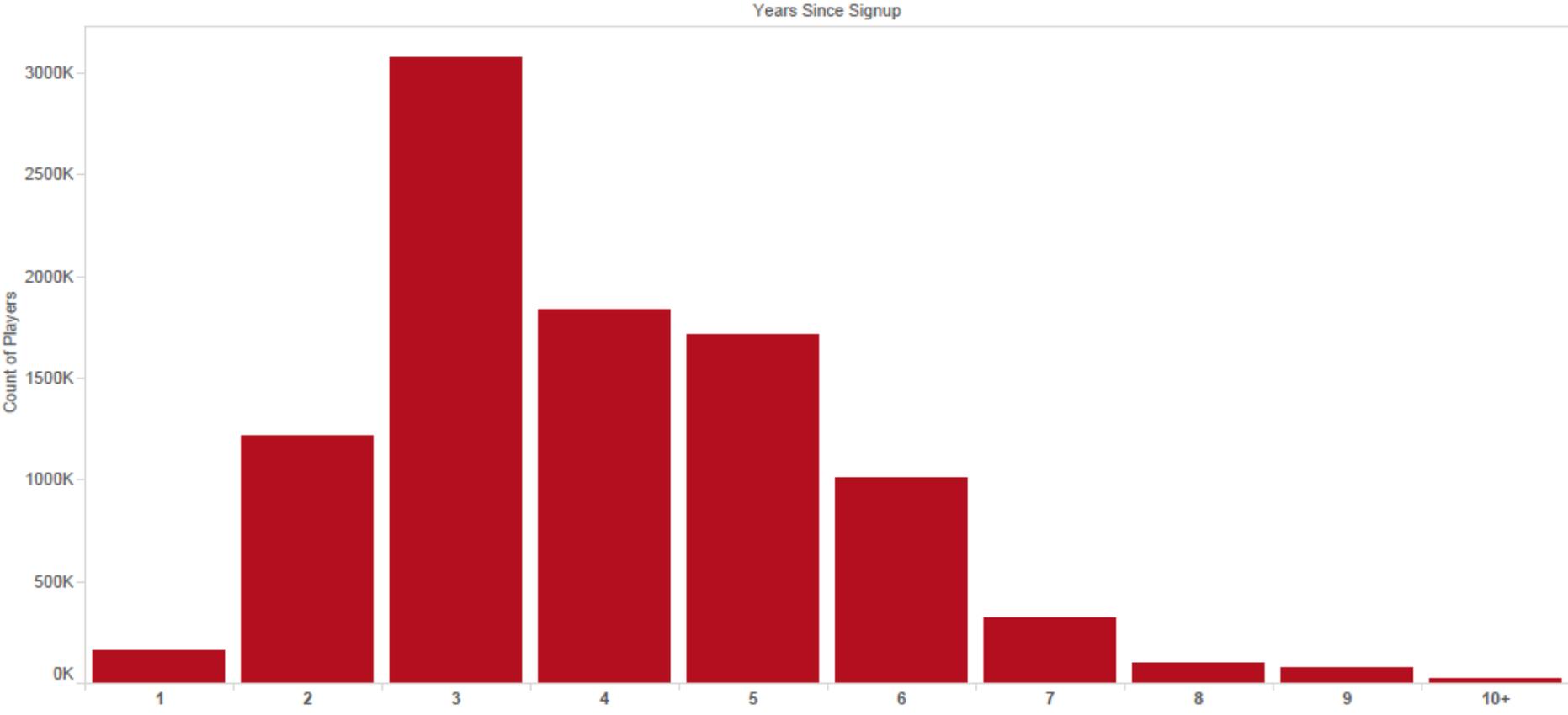
Andrew's Individual Play Data

round_id	roundStart Date	round_ Duration Seconds	server_ type	level_ name	game_ mode	player Duration	Total Score	roles_played	activities	killCnt	deathCnt
1266595	10/29/2011	1154.07	public	levelA	mode1	1020.83	6721	playedRole3,	activity1, activity4,	12	0
3140702	10/31/2011	1050.89	public	levelB	mode1	618.33	1541	playedRole2,		2	0
5042110	11/1/2011	633.96	public	levelB	mode1	347.06	1375	playedRole3,		1	0
5056805	11/1/2011	949.28	public	levelC	mode1	735.24	2708	playedRole3,		6	0
5061363	11/1/2011	1468.96	public	levelD	mode1	1389.2	7520	playedRole3,		31	0
5061822	11/1/2011	857.47	public	levelE	mode1	656.04	2354	playedRole2,	activity1,	10	0
5070701	11/1/2011	1201.56	public	levelF	mode1	1098.3	5954	playedRole2,pla yedRole3,playe dRole4,		19	0
5099592	11/1/2011	942.35	public	levelG	mode1	847.44	3105	playedRole2,		12	0
5119149	11/1/2011	1093.22	public	levelC	mode1	702.1	2652	playedRole2,pla yedRole3,	activity4,	5	0
5128120	11/1/2011	655.36	public	levelB	mode1	107.24	775	playedRole3,		1	0
5129924	11/1/2011	986.94	public	levelH	mode1	809.14	4067	playedRole2,	activity3,	10	0
5135652	11/1/2011	936.59	public	levelI	mode1	847.53	3379	playedRole3,	activity1, activity3,	12	0
5144135	11/1/2011	1116.24	public	levelI	mode1	937.93	3950	playedRole2,pla yedRole3,	activity3,	13	0
5323280	11/1/2011	1591.29	public	levelA	mode1	1194.73	3542	playedRole3,	activity1 activity2,	7	0

Age of Players in Focal Sample



Player Tenure



**as of March 4, 2014*



People Play Internationally

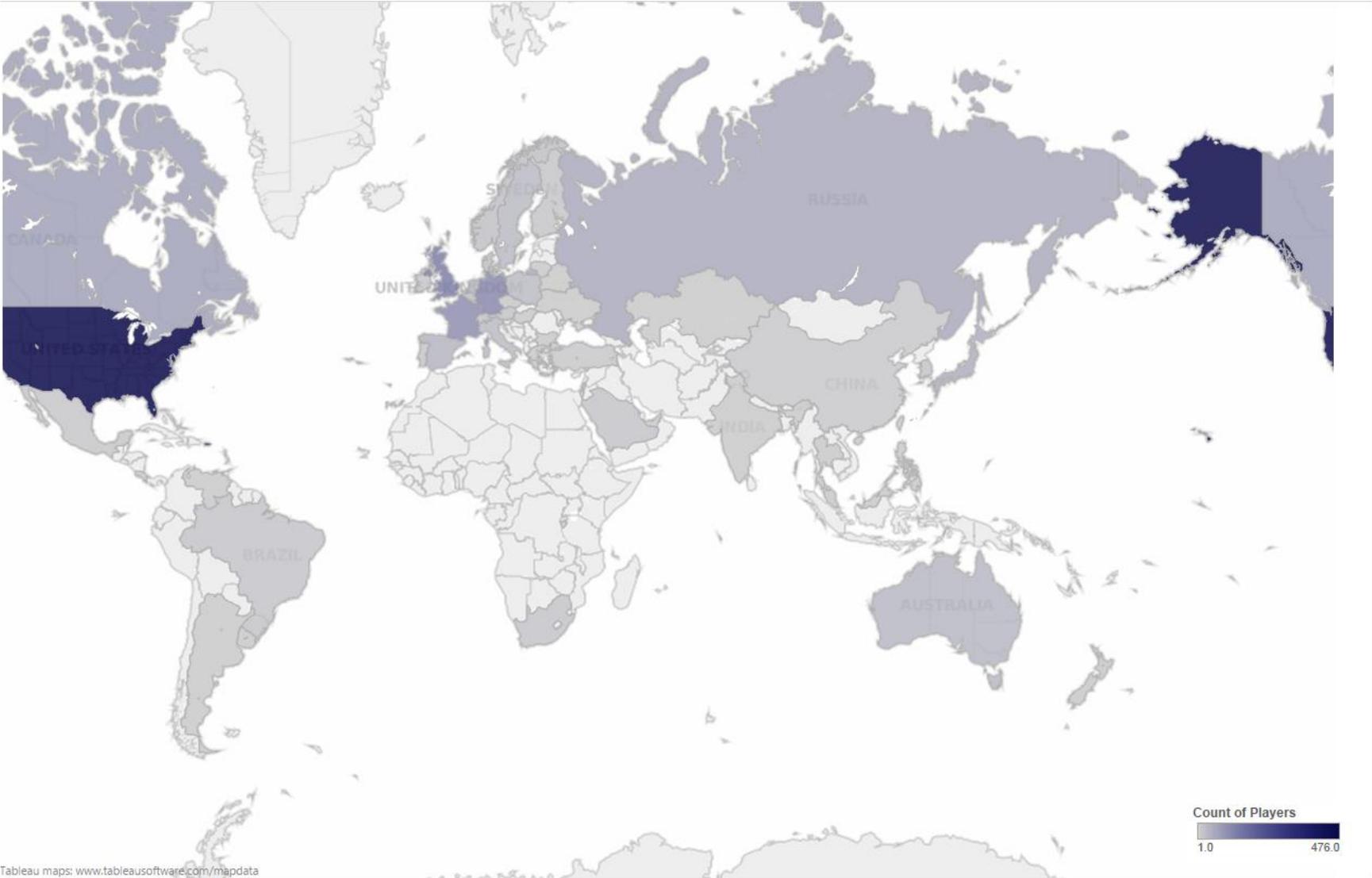
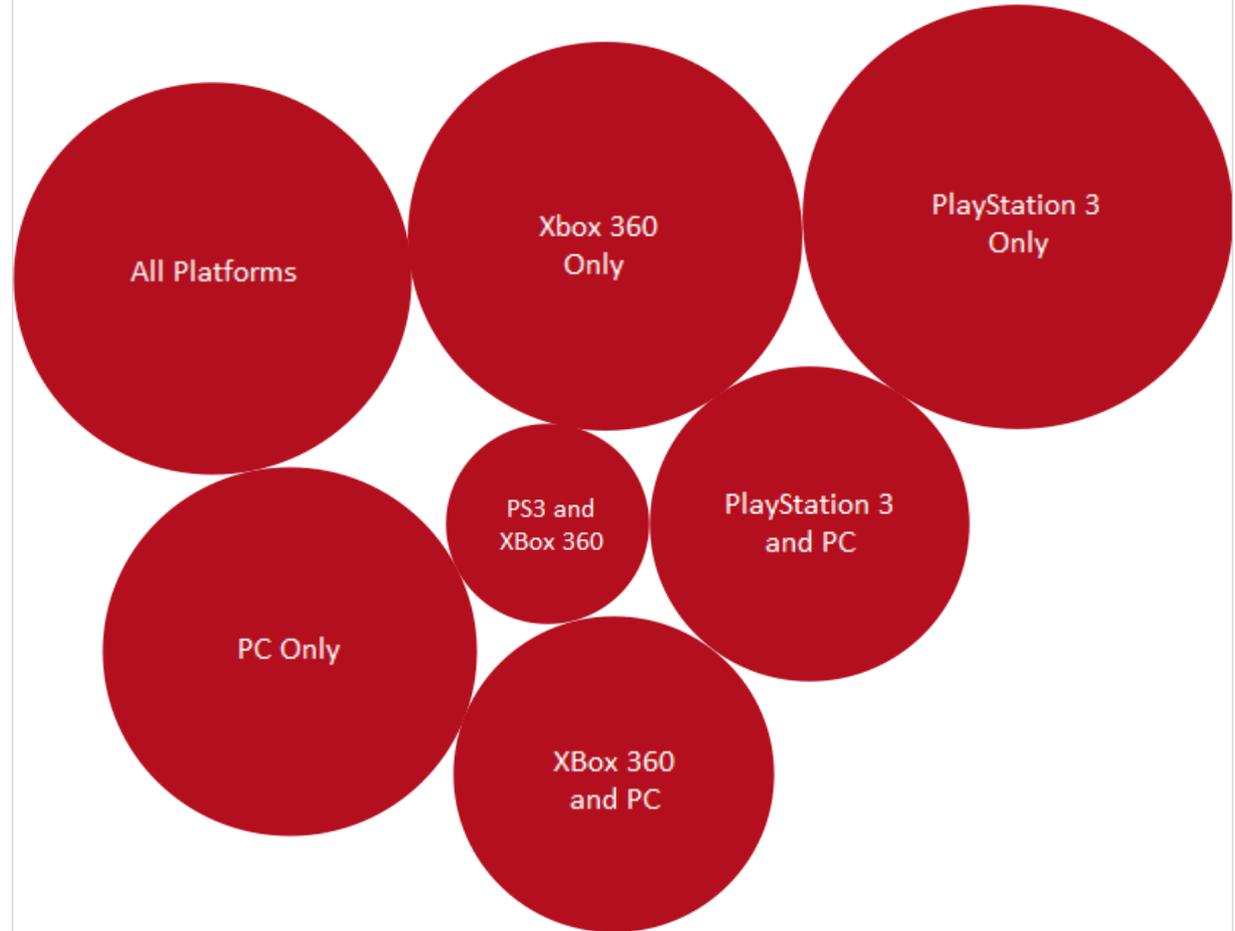


Tableau maps: www.tableausoftware.com/mapdata

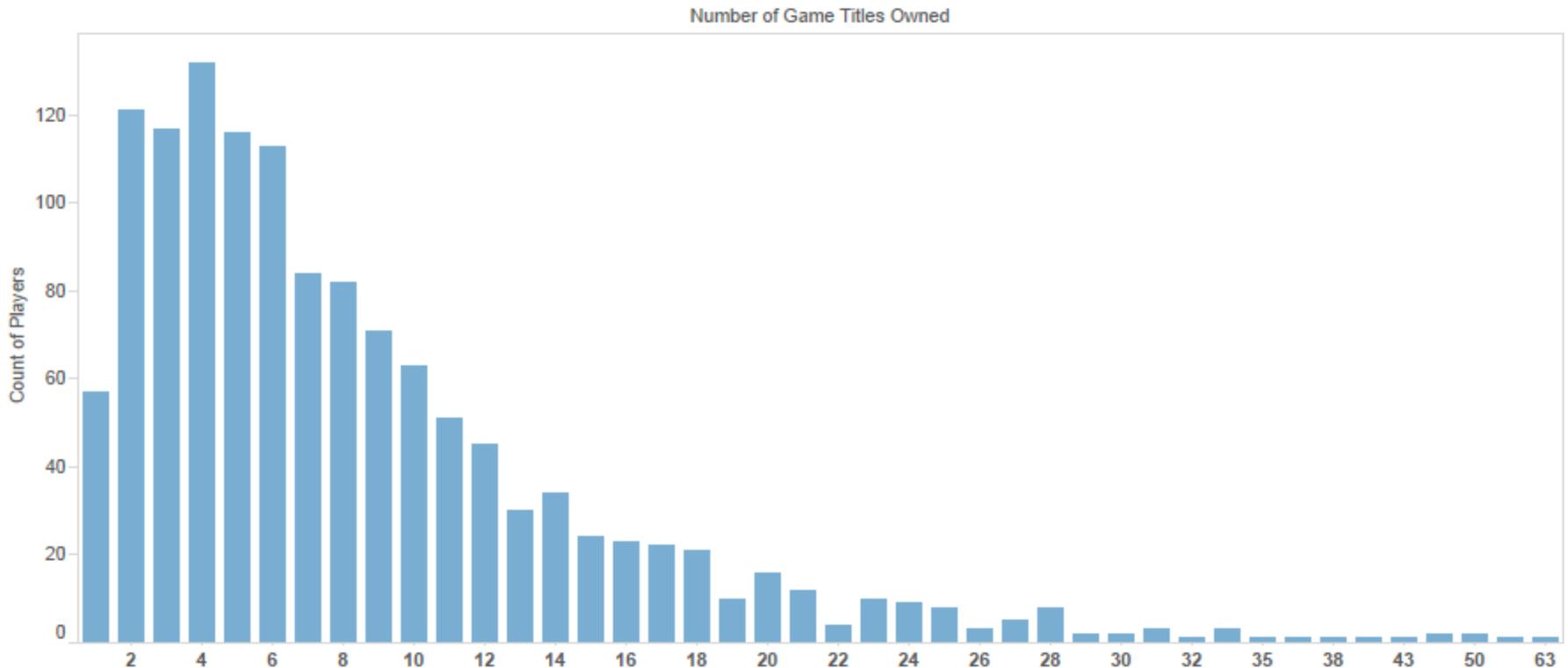
The Players

The game is available to play on three separate gaming platforms: PlayStation 3, Xbox360, and PC.



Game Titles Owned

- 39.7% of players in the dataset own between 1 and 5 game titles.



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The Research Question

Key Research Question from the Sponsor:

- How should the company match players who use the “instant play” feature to a particular team on a particular server?



The Research Questions

- The sponsor is open to unique/novel research areas using this same data set.
- Other possible research areas:
 - Modeling unobservable customer churn
 - How does unobservable churn relate to skill level and other important attributes?
 - Understanding game play as media consumption and detecting /modeling patterns



Benefits of Participating in a WCAI Research Opportunity

- Access to **unique data**
- Assistance with data cleaning, preparation, and processing **at any point during the Research Opportunity**
- Teleconference Q&A sessions **with the research sponsor**
- Opportunity to **present findings to the Corporate Sponsor at the closing symposium, to be held at Wharton one year from now**
(note: attendance by at least one member from each team required)
- Potential for **additional PR for your research**
- **Promotion of your research paper through the WCAI SSRN Research Paper Series**



Proposal Format

Proposals should be no more than 2,000 words and include the following:

- **Title**
- **Author(s) name, title, affiliation and e-mail address:** Please designate a corresponding author.
- **Summary information:** a single “slide” that visually summarizes team & project.
- **Abstract**
- **Introduction:** Describe expected contribution(s), covering both the academic and practical aspects. Please keep it concise, and cite relevant work as necessary to explain your academic contribution. There is no need to include a lengthy literature review.
- **Detailed project proposal:** Please include enough detail that we can assess the feasibility & merit of the proposed approach. For example, modeling projects should include at least a sketch of the model. In addition, include a rough estimate of how long the project will take. Also include the business relevance of your research and the impact for the sponsor as well.
- **Biographies:** Include up to a paragraph-long biography highlighting what each team member will contribute to the project. **The data sponsor is also interested in learning about the team members’ interests in gaming.**

PDFs ONLY PLEASE!



Proposal Submission Process

- Read more about the proposal format at <http://www.wharton.upenn.edu/wcai/Proposals.cfm>
- Submit proposals at <http://www.wharton.upenn.edu/wcai/proposalform.cfm> no later than Monday, May 12, 2014, 12 noon US Eastern.
 - Proposals will only be accepted online.
 - A single PDF combining the written portion and the single slide.
- Proposals will be evaluated both on academic contribution and potential to significantly improve the research sponsor's marketing practice.
 - Shane Jensen (The Wharton School), Jim Albert (Bowling Green State University), Eric Bradlow (WCAI), Pete Fader (WCAI), Elea Feit (WCAI), and representatives from the Research Sponsor.
- Contact wcai-research@wharton.upenn.edu, if you have questions prior to submitting your proposal.



Other WCAI Opportunities for Researchers

If you registered for this webinar, you will receive regular announcements regarding:

- Research Opportunities like this one
 - Using Purchase History to Identify Customer “Projects”
 - Desktop Software Use Analysis
- Conferences
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Register at <http://www.wharton.upenn.edu/wcai/1299.cfm>

Also find us at:

- SSRN Research Paper series:
<http://www.ssrn.com/link/Wharton-Cust-Analytics-Initiative-RES.html>
- Announcements: <http://wcai.wharton.upenn.edu>





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