NBA Player Performance

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1 Introduction

We're exploring the relationship between physical characteristics (height, weight) and draft outcomes in the NBA.

Research questions:
- What's the distribution of height and weight among drafted players?

- How do physical attributes relate to draft pick or round?

- Any general patterns in the dataset?

1.1 Analysis and Coding Paradigms

We used an exploratory data analysis approach to investigate trends and patterns without testing specific hypotheses. This approach fits our goal of understanding how physical characteristics relate to draft outcomes. For coding, we used the Tidyverse framework, including `dplyr`, `ggplot2`, `tidyr`, and `readr`. These tools support a clean and consistent workflow that made it easier to wrangle data and produce visual summaries.

1.2 PCIP Reflection

Plan: We planned to investigate how height and weight relate to NBA draft outcomes. Our approach included merging two datasets, cleaning them, and using visual summaries and descriptive statistics to explore trends.

Code: We used Tidyverse tools like `dplyr`, `ggplot2`, `readr`, and `tidyr` for data wrangling, plotting, and summarizing.

Improve: We adjusted bin widths, fixed axis labels, and made the visuals easier to interpret. We also replaced raw tables with formatted outputs using `kable()`.

Polish: The final report includes clear section headers, consistent formatting, and supporting text under each graph to help readers understand the findings.

2 Data Source

Data come from Wyatt O'Walsh's Kaggle repo (https://www.kaggle.com/datasets/wyattowalsh/basketball/data originally collected by the NBA. Cases = individual players; variables = physical stats and draft history.

Each row in the dataset represents an individual NBA player. The dataset includes physical characteristics such as height, weight, and BMI, as well as draft information like round, pick number, and season experience. These variables allow us to explore how player attributes relate to draft outcomes.

2.1 FAIR

- Findable: The dataset is indexed on Kaggle and includes detailed metadata.
- Accessible: It is downloadable with a Kaggle account, which may limit full accessibility.
- Interoperable: The data is provided in CSV format, which is compatible with most tools.
- Reusable: It has a CC BY 4.0 license, allowing for redistribution and reuse with attribution.

While the data meets the FAIR principles on a surface level, there are minor limitations. For example, requiring a Kaggle account adds a layer of friction to access. Additionally, some metadata (such as data collection methodology) could be more detailed to improve reusability.

2.2 CARE

- Collective Benefit: The dataset is shared publicly and intended for analytical use.
- Authority to Control: The dataset was uploaded by a Kaggle user, with no evidence of broader community governance.
- Responsibility: The source appears ethically collected, but the original collection process is not documented.
- Ethics: Since the dataset contains public sports statistics, there are minimal privacy concerns.

Although there are no direct ethical violations, the dataset's alignment with CARE is limited. It lacks mechanisms for affected communities (e.g., players) to engage with or influence how the data is used. The absence of collection details also makes it harder to fully assess responsibility.

3 Setup & Data Cleaning

```r
# Load necessary libraries and import NBA player and draft data
library(dplyr)
library(janitor)
library(ggplot2)
library(tidyr)
library(readr)
library(stringr)

# Read Data
player_info <- read_csv("https://raw.githubusercontent.com/jiangyeee0/STAT-184-/main/common_p
draft_history <- read_csv("https://raw.githubusercontent.com/jiangyeee0/STAT-184-/main/draft_

# Clean player data: extract height, weight, calculate BMI, and handle missing values
player_clean <- player_info %>%
  mutate(
    feet = as.numeric(str_extract(height, "^[0-9]+")),
    inches = as.numeric(str_extract(height, "(?<=-)[0-9]+")),
    height_in = feet * 12 + replace_na(inches, 0),
    weight = as.numeric(str_extract(weight, "[0-9]+")),
    bmi = (703 * weight) / (height_in^2),
    # Replace missing height and weight values with the median to preserve data while avoidin
    across(c(height_in, weight), ~replace_na(., median(., na.rm = TRUE))))

# Clean Draft History
draft_clean <- draft_history %>%
  mutate(across(c(overall_pick, round_number, round_pick), as.numeric))

# Merge two databases
nba_data <- inner_join(
  player_clean,
  draft_clean,
  by = "person_id"
)
```

4 Exploratory Data Analysis

4.1 Glimpse of Data

```r
# Preview the structure of the merged NBA dataset
glimpse(nba_data)
```

```
Rows: 2,985
Columns: 50
$ person_id                        <dbl> 76001, 76003, 1505, 949, 76005, 76006~
$ first_name                       <chr> "Alaa", "Kareem", "Tariq", "Shareef",~
$ last_name                        <chr> "Abdelnaby", "Abdul-Jabbar", "Abdul-W~
$ display_first_last               <chr> "Alaa Abdelnaby", "Kareem Abdul-Jabba~
$ display_last_comma_first         <chr> "Abdelnaby, Alaa", "Abdul-Jabbar, Kar~
$ display_fi_last                  <chr> "A. Abdelnaby", "K. Abdul-Jabbar", "T~
$ player_slug                      <chr> "alaa-abdelnaby", "kareem-abdul-jabba~
$ birthdate                        <dttm> 1968-06-24, 1947-04-16, 1974-11-03, ~
$ school                           <chr> "Duke", "UCLA", "San Jose State", "Ca~
$ country                          <chr> "USA", "USA", "France", "USA", "USA",~
$ last_affiliation                 <chr> "Duke/USA", "UCLA/USA", "San Jose Sta~
$ height                           <chr> "6-10", "7-2", "6-6", "6-9", "6-7", "~
$ weight                           <dbl> 240, 225, 235, 245, 220, 180, 200, 22~
$ season_exp                       <dbl> 5, 20, 7, 13, 5, 1, 3, 3, 3, 1, 6, 7,~
$ jersey                           <chr> "30", "33", "9", "3", "5", "6", NA, "~
$ position                         <chr> "Forward", "Center", "Forward-Guard",~
$ rosterstatus                     <chr> "Inactive", "Inactive", "Inactive", "~
$ games_played_current_season_flag <chr> "N", "N", "N", "N", "N", "N", "N", "N~
$ team_id.x                        <dbl> 1610612757, 1610612747, 1610612758, 1~
$ team_name.x                      <chr> "Trail Blazers", "Lakers", "Kings", "~
$ team_abbreviation.x              <chr> "POR", "LAL", "SAC", "VAN", "GOS", "P~
$ team_code                        <chr> "blazers", "lakers", "kings", "grizzl~
$ team_city.x                      <chr> "Portland", "Los Angeles", "Sacrament~
$ playercode                       <chr> "HISTADD_alaa_abdelnaby", "HISTADD_ka~
$ from_year                        <dbl> 1990, 1969, 1997, 1996, 1976, 1956, 2~
$ to_year                          <dbl> 1994, 1988, 2003, 2007, 1980, 1956, 2~
$ dleague_flag                     <chr> "N", "N", "N", "N", "N", "N", "N", "N~
$ nba_flag                         <chr> "Y", "Y", "Y", "Y", "Y", "Y", "Y", "Y~
$ games_played_flag                <chr> "Y", "Y", "Y", "Y", "Y", "Y", "Y", "Y~
$ draft_year                       <chr> "1990", "1969", "1997", "1996", "1976~
$ draft_round                      <chr> "1", "1", "1", "1", "3", NA, "2", "1"~
$ draft_number                     <chr> "25", "1", "11", "3", "43", NA, "32",~
$ greatest_75_flag                 <chr> "N", "Y", "N", "N", "N", "N", "N", "N~
$ feet                             <dbl> 6, 7, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6~
$ inches                           <dbl> 10, 2, 6, 9, 7, 3, 6, 8, 5, 0, 11, 7,~
$ height_in                        <dbl> 82, 86, 78, 81, 79, 75, 78, 80, 77, 7~
$ bmi                              <dbl> 25.09221, 21.38656, 27.15401, 26.2513~
$ player_name                      <chr> "Alaa Abdelnaby", "Kareem Abdul-Jabba~
$ season                           <dbl> 1990, 1969, 1997, 1996, 1976, 1956, 2~
$ round_number                     <dbl> 1, 1, 1, 1, 3, 0, 2, 1, 2, 2, 2, 2, 1~
$ round_pick                       <dbl> 25, 1, 11, 3, 9, 0, 2, 20, 30, 0, 16,~
$ overall_pick                     <dbl> 25, 1, 11, 3, 43, 0, 32, 20, 60, 0, 4~
$ draft_type                       <chr> "Draft", "Draft", "Draft", "Draft", "~
$ team_id.y                        <dbl> 1610612757, 1610612749, 1610612758, 1~
$ team_city.y                      <chr> "Portland", "Milwaukee", "Sacramento"~
$ team_name.y                      <chr> "Trail Blazers", "Bucks", "Kings", "G~
$ team_abbreviation.y              <chr> "POR", "MIL", "SAC", "VAN", "LAL", "S~
$ organization                     <chr> "Duke", "California-Los Angeles", "Sa~
$ organization_type                <chr> "College/University", "College/Univer~
$ player_profile_flag              <dbl> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1~
```

4.2 Summary of Numeric Variables

```r
# Summarize numeric variables (mean, median, sd, min, max, missing values)
num_summary <- nba_data %>%
  select(bmi, height_in, weight, season_exp, round_number,
         round_pick, draft_type, player_profile_flag, overall_pick) %>%
  select(where(is.numeric)) %>%
  pivot_longer(everything(), names_to = "variable", values_to = "value") %>%
  group_by(variable) %>%
  summarise(
    mean = mean(value, na.rm = TRUE),
    median = median(value, na.rm = TRUE),
    sd = sd(value, na.rm = TRUE),
    min = min(value, na.rm = TRUE),
    max = max(value, na.rm = TRUE),
    n_missing = sum(is.na(value)),
    .groups = 'drop'
  )

knitr::kable(num_summary, caption = "Descriptive statistics of numeric variables")
```

Table 1: Descriptive statistics of numeric variables

variable	mean	median	sd	min	max	n_missing
bmi	24.212486	24.10837	1.7702244	17.35802	33.75171	50
height_in	78.420771	79.00000	3.4895244	66.00000	91.00000	0
overall_pick	30.603685	24.00000	29.8037716	0.00000	221.00000	0
player_profile_flag	0.999665	1.00000	0.0183032	0.00000	1.00000	0
round_number	2.059632	2.00000	1.9194037	0.00000	20.00000	0
round_pick	10.979565	9.00000	8.0868226	0.00000	30.00000	0
season_exp	5.982915	4.00000	4.7041896	0.00000	22.00000	0
weight	212.454271	210.00000	26.4316358	133.00000	325.00000	0

5 Graphs

5.1 Height Distribution

```r
# Plot histogram of player heights
ggplot(nba_data, aes(x = height_in)) +
  geom_histogram(binwidth = 1, fill = "skyblue", color = "black") +
  labs(
    title = "Height Distribution of NBA Drafted Players",
    x = "Height (inches)",
    y = "Count"
  )
```

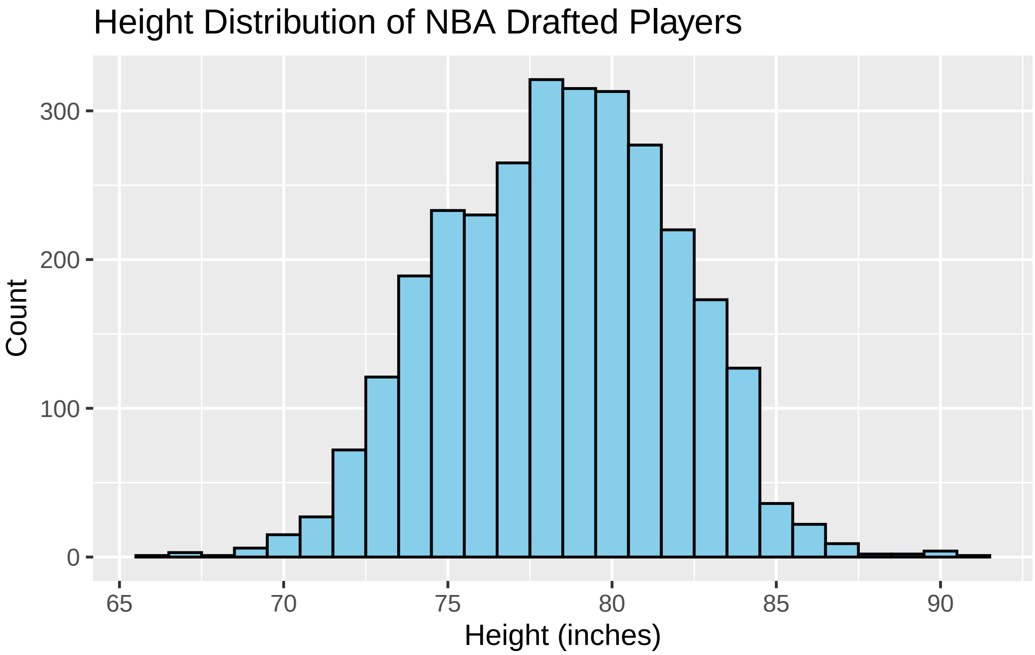
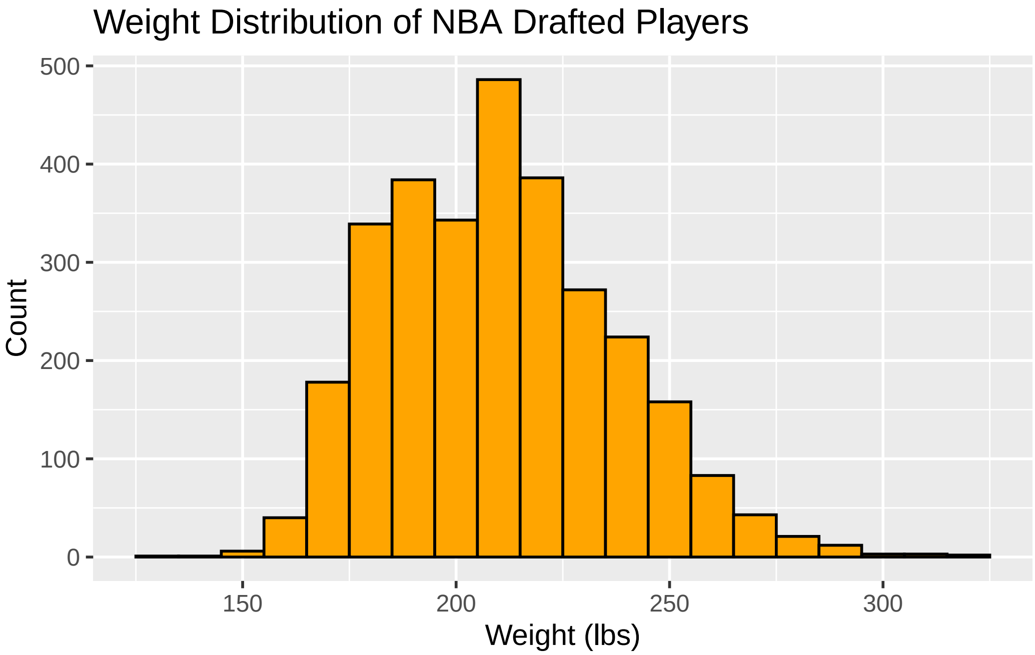


Figure shows that most players are between 75 and 82 inches tall.

5.2 Weight Distribution

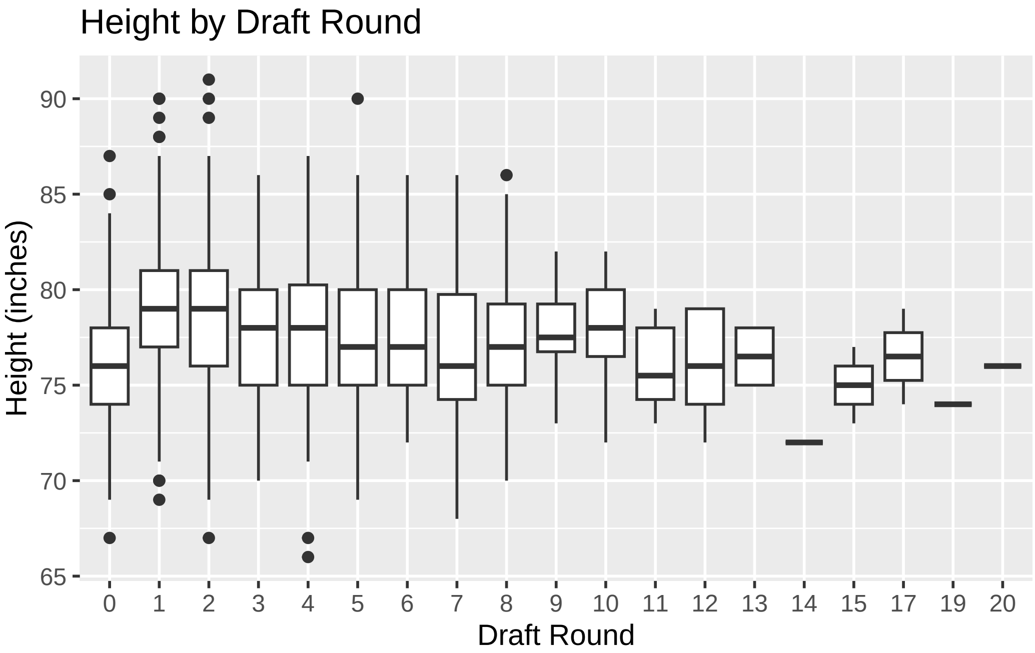
```r
# Plot histogram of player weights
ggplot(nba_data, aes(x = weight)) +
  geom_histogram(binwidth = 10, fill = "orange", color = "black") +
  labs(
    title = "Weight Distribution of NBA Drafted Players",
    x = "Weight (lbs)",
    y = "Count"
  )
```



Most players weigh between 190 and 240 pounds.

5.3 Draft Round vs Height

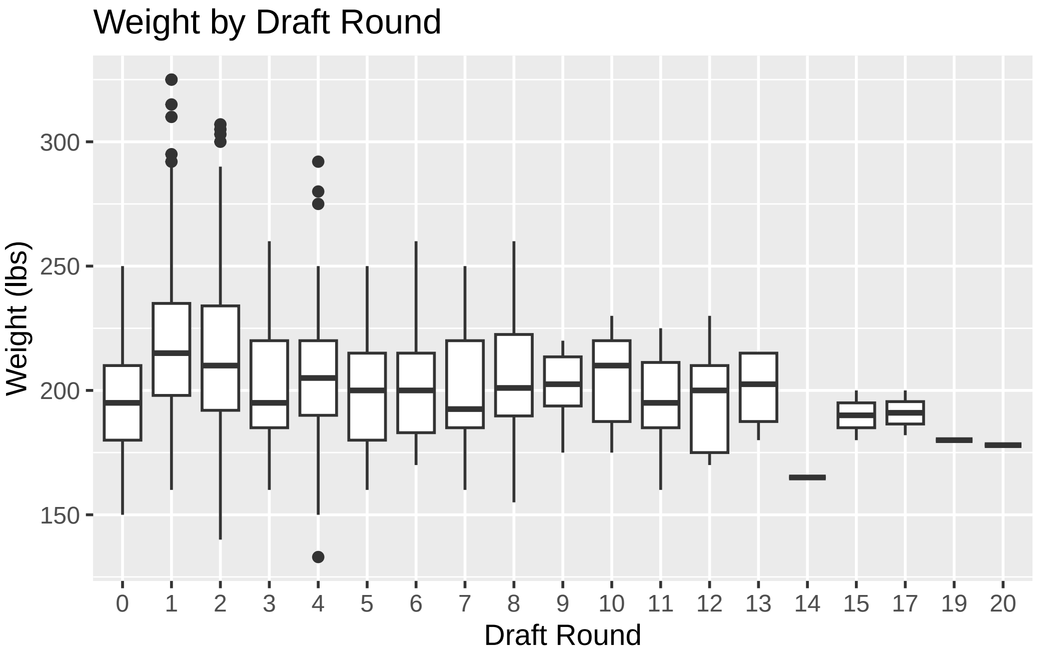
```
# Plot boxplot of height by draft round
nba_data %>%
  ggplot(aes(x = factor(round_number), y = height_in)) +
  geom_boxplot() +
  labs(
    title = "Height by Draft Round",
    x = "Draft Round",
    y = "Height (inches)"
  )
```



Round 1 players are generally taller.

5.4 Draft Round vs Weight

```
# Plot boxplot of weight by draft round
nba_data %>%
  ggplot(aes(x = factor(round_number), y = weight)) +
  geom_boxplot() +
  labs(
    title = "Weight by Draft Round",
    x = "Draft Round",
    y = "Weight (lbs)"
  )
```



Round 1 players weigh more on average.

5.5 Height and Weight by Draft Round

```
# Plot scatter of height vs. weight colored by BMI
round_summary <- nba_data %>%
  group_by(round_number) %>%
  summarise(
    Avg_Height = mean(height_in, na.rm = TRUE),
    Median_Height = median(height_in, na.rm = TRUE),
    Avg_Weight = mean(weight, na.rm = TRUE),
    Median_Weight = median(weight, na.rm = TRUE),
    n_players = n(),
    .groups = 'drop'
  ) %>%
  mutate(round_number = paste("Round", round_number))
knitr::kable(round_summary, caption = "Height and weight by draft round")
```

Table 2: Height and weight by draft round

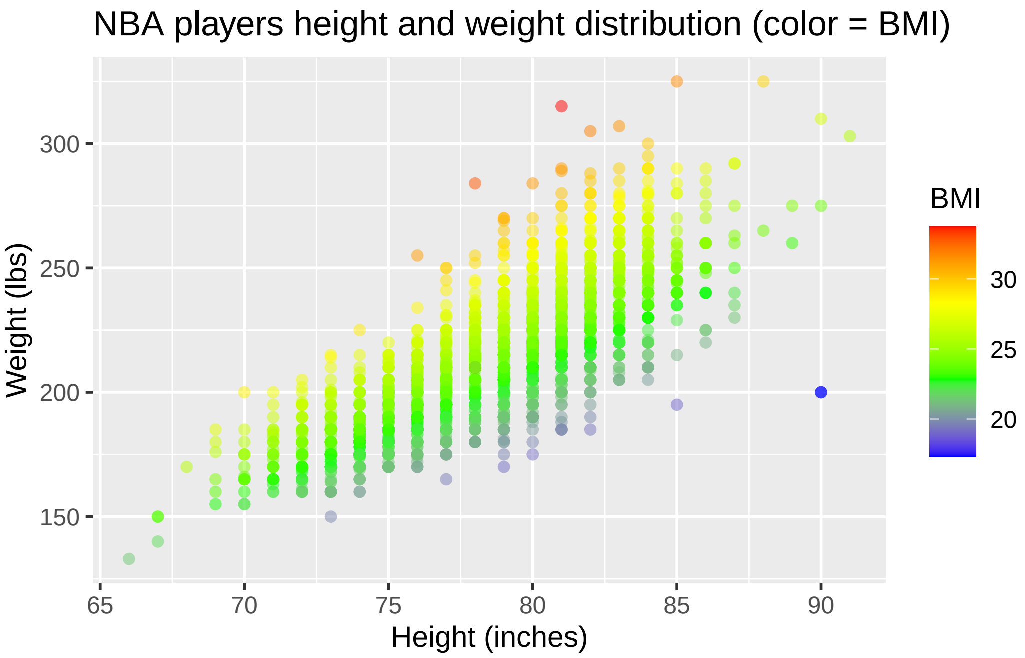
round_number	Avg_Height	Median_Height	Avg_Weight	Median_Weight	n_players
Round 0	75.89167	76.0	195.0750	195.0	120
Round 1	78.96402	79.0	217.2886	215.0	1334
Round 2	78.50734	79.0	214.2222	210.0	954
Round 3	77.71698	78.0	201.8632	195.0	212
Round 4	77.93966	78.0	205.1034	205.0	116
Round 5	77.31507	77.0	199.3425	200.0	73
Round 6	77.67347	77.0	201.1224	200.0	49
Round 7	76.84211	76.0	200.0789	192.5	38
Round 8	77.47222	77.0	205.6667	201.0	36
Round 9	77.75000	77.5	202.8125	202.5	16
Round 10	77.63636	78.0	205.4545	210.0	11
Round 11	76.00000	75.5	196.0000	195.0	10
Round 12	76.00000	76.0	197.0000	200.0	5
Round 13	76.50000	76.5	200.0000	202.5	4
Round 14	72.00000	72.0	165.0000	165.0	1
Round 15	75.00000	75.0	190.0000	190.0	2
Round 17	76.50000	76.5	191.0000	191.0	2
Round 19	74.00000	74.0	180.0000	180.0	1
Round 20	76.00000	76.0	178.0000	178.0	1

Regarding “Round 0” in NBA graphs/tables: The dataset used 0 to represent undrafted players.

Table shows that Round 1 players are generally the tallest and heaviest group.

5.6 Height and Weight Distribution (color = BMI)

```r
ggplot(nba_data, aes(x = height_in, y = weight)) +
  geom_point(aes(color = bmi), alpha = 0.5) +
  scale_color_gradientn(
    name = "BMI",
    colors = c("blue", "green", "yellow", "red"),
    breaks = c(20, 25, 30)
  ) +
  labs(
    title = "NBA players height and weight distribution (color = BMI)",
    x = "Height (inches)",
    y = "Weight (lbs)"
  )
```



Scatter plot shows player height vs. weight, with color indicating BMI. Higher BMI players appear in red.

6 Narrative Summary

Figure 5.1 shows that most players are between 75 and 82 inches tall. This suggests a concentration around average professional basketball height. Figure 5.2 shows a similar concentration in weight, mostly between 190 and 240 pounds.

Figures 5.3 and 5.4 compare height and weight across draft rounds. Players selected in Round 1 tend to be taller and heavier than those drafted later, which may reflect team preferences for physical advantages early in the draft.

Table 1 summarizes key statistics, confirming that most values are tightly clustered around typical NBA physical profiles. Table 5.5 reinforces the earlier finding by showing Round 1 players have the highest average height and weight.

Figure 5.6 adds a BMI layer. While most players fall in the expected athletic range, outliers on the higher end may suggest different play styles or positions (e.g., centers).

Taken together, these visualizations suggest that while physical attributes don't determine draft outcomes alone, they clearly play a role, especially in earlier rounds.

7 Conclusion

Draft outcomes show slight tendencies towards specific physical profiles, though clear gaps remain between players selected in different rounds.

Using R allowed us to efficiently explore patterns in the data and communicate our findings through clear summaries and visualizations.

8 Code Appendix

```r
# Load necessary libraries and import NBA player and draft data
library(dplyr)
library(janitor)
library(ggplot2)
library(tidyr)
library(readr)
library(stringr)

# Read Data
player_info <- read_csv("https://raw.githubusercontent.com/jiangyeee0/STAT-184-/main/common_p
draft_history <- read_csv("https://raw.githubusercontent.com/jiangyeee0/STAT-184-/main/draft_

# Clean player data: extract height, weight, calculate BMI, and handle missing values
player_clean <- player_info %>%
  mutate(
    feet = as.numeric(str_extract(height, "^[0-9]+")),
    inches = as.numeric(str_extract(height, "(?<=-)[0-9]+")),
    height_in = feet * 12 + replace_na(inches, 0),
    weight = as.numeric(str_extract(weight, "[0-9]+")),
    bmi = (703 * weight) / (height_in^2),
    # Replace missing height and weight values with the median to preserve data while avoidin
    across(c(height_in, weight), ~replace_na(., median(., na.rm = TRUE))))

# Clean Draft History
```

```r
draft_clean <- draft_history %>%
  mutate(across(c(overall_pick, round_number, round_pick), as.numeric))

# Merge two databases
nba_data <- inner_join(
  player_clean,
  draft_clean,
  by = "person_id"
)

# Preview the structure of the merged NBA dataset
glimpse(nba_data)
# Summarize numeric variables (mean, median, sd, min, max, missing values)
num_summary <- nba_data %>%
  select(bmi, height_in, weight, season_exp, round_number,
         round_pick, draft_type, player_profile_flag, overall_pick) %>%
  select(where(is.numeric)) %>%
  pivot_longer(everything(), names_to = "variable", values_to = "value") %>%
  group_by(variable) %>%
  summarise(
    mean = mean(value, na.rm = TRUE),
    median = median(value, na.rm = TRUE),
    sd = sd(value, na.rm = TRUE),
    min = min(value, na.rm = TRUE),
    max = max(value, na.rm = TRUE),
    n_missing = sum(is.na(value)),
    .groups = 'drop'
  )

knitr::kable(num_summary, caption = "Descriptive statistics of numeric variables")
# Plot histogram of player heights
ggplot(nba_data, aes(x = height_in)) +
  geom_histogram(binwidth = 1, fill = "skyblue", color = "black") +
  labs(
    title = "Height Distribution of NBA Drafted Players",
    x = "Height (inches)",
    y = "Count"
  )

# Plot histogram of player weights
ggplot(nba_data, aes(x = weight)) +
  geom_histogram(binwidth = 10, fill = "orange", color = "black") +
  labs(
    title = "Weight Distribution of NBA Drafted Players",
    x = "Weight (lbs)",
    y = "Count"
  )
# Plot boxplot of height by draft round
nba_data %>%
  ggplot(aes(x = factor(round_number), y = height_in)) +
  geom_boxplot() +
  labs(
    title = "Height by Draft Round",
    x = "Draft Round",
    y = "Height (inches)"
  )
# Plot boxplot of weight by draft round
nba_data %>%
  ggplot(aes(x = factor(round_number), y = weight)) +
  geom_boxplot() +
  labs(
    title = "Weight by Draft Round",
    x = "Draft Round",
    y = "Weight (lbs)"
  )
# Plot scatter of height vs. weight colored by BMI
round_summary <- nba_data %>%
  group_by(round_number) %>%
  summarise(
    Avg_Height = mean(height_in, na.rm = TRUE),
    Median_Height = median(height_in, na.rm = TRUE),
    Avg_Weight = mean(weight, na.rm = TRUE),
    Median_Weight = median(weight, na.rm = TRUE),
    n_players = n(),
    .groups = 'drop'
  ) %>%
  mutate(round_number = paste("Round", round_number))
knitr::kable(round_summary, caption = "Height and weight by draft round")
ggplot(nba_data, aes(x = height_in, y = weight)) +
  geom_point(aes(color = bmi), alpha = 0.5) +
  scale_color_gradientn(
    name = "BMI",
    colors = c("blue", "green", "yellow", "red"),
    breaks = c(20, 25, 30)
  ) +
  labs(
    title = "NBA players height and weight distribution (color = BMI)",
    x = "Height (inches)",
    y = "Weight (lbs)"
  )
```

9 References

- O’Walsh, W. (2025). *Basketball Data* [Data set]. Kaggle.
- NBA. (n.d.). *Official Player Stats*. NBA.com.