Case Study: How Can a Wellness Technology Company Play It Smart?

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Statement of Business Task

Analyze publicly available fitness tracker (smart device) usage data to discover trends which may help influence the marketing strategy for a wellness technology company Bellabeat.

Data Preparation and Data Exploration

➤ The data used for this case study is the "**FitBit Fitness Tracker Data**" which was downloaded from Kaggle.

➤ This Kaggle data set contains personal fitness tracker from thirty fitbit users. Thirty eligible Fitbit users consented to the submission of personal tracker data, including minute-level output for **physical activity**, **heart rate**, and **sleep monitoring**. It includes information about daily activity, steps, and heart rate that can be used to explore users' habits.

➤ There are 18 files in the dataset. Not all the files were used for the analysis. The following is a description of the files used in this case study:

- dailyActivity_merged.csv - this file contains the following columns: Id, ActivityDate, (in Short Date format "m/d/yyyy"), TotalSteps, TotalDistance, VeryActiveDistance, ModeratelyActiveDistance, LightActiveDistance, SedentaryActiveDistance, VeryActiveMinutes, FairlyActiveMinutes, LightlyActiveMinutes, SedentaryMinutes, Calories, etc.

- heartrate_seconds_merged.csv - this file contains the following columns: Id, Time (in "m/d/yyyy h:mm" format), Value (heartrate).

- sleepDay_merged.csv - this file contains the following columns: Id, SleepDay (in "m/d/yyyy h:mm" format), TotalSleepRecords, TotalMinutesAsleep, and TotalTimeInBed.

- weightLogInfo_merged.csv - this file contains the following columns: Id, Date (in "m/d/yyyy h:mm" format), WeightKg, WeightPounds, Fat, BMI, etc.

Key Findings

- Here are the trends found while analyzing smart device usage data from a public dataset:
  - The consumers in this dataset used smart devices to **track daily activity** such as how many steps they took, how far they walked at each intensity level, how long each intensity level lasted, and how many calories they burned.
  - The consumers used smart devices to **monitor** their **heart rate**.
  - The consumers used smart devices to **watch** their **weight** and **BMI level**.
  - The consumers used smart devices to track their **sleep duration** and **sleep efficiency**.
- These trends can apply to Bellabeat customers because:
  - Bellabeat's products like **Bellabbeat app**, **Leaf** and **Time** track user **activity**, **sleep**, and **stress**.
  - From the previous bullet item, we know that consumers use non-Bellabeat smart devices to track their **daily activity**, **sleep**, **heart rate**, **weight**, and **BMI** level.
  - Potentially biased data were removed prior to our analysis, meaning that our data represent a good sampling distribution. Therefore, trends found in our analysis regarding **activity** and **sleep** should apply to Bellabeat customers.
  - Stress may/may not cause abnormal heart rate or weight changes. However, the trends discovered in our analysis should help Bellabeat get the data its users want or need.
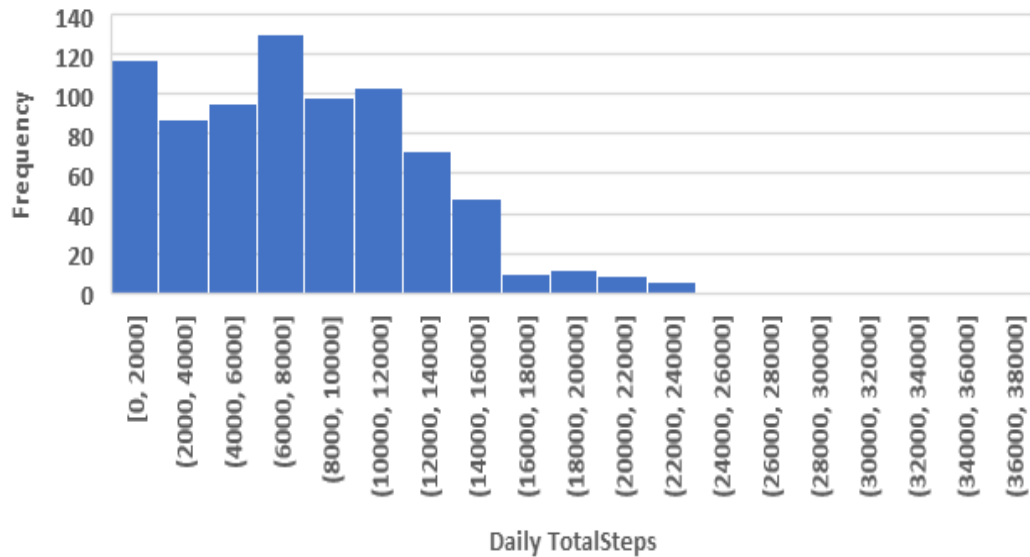
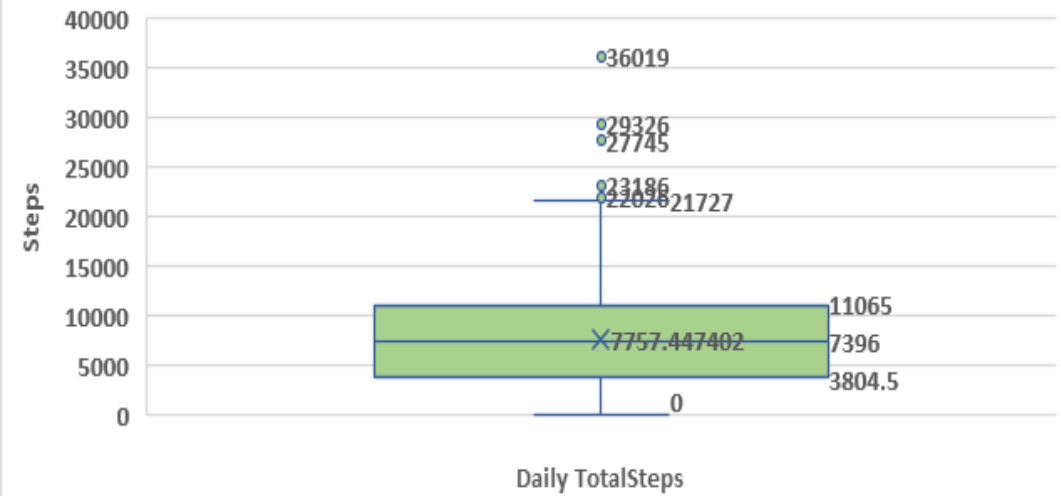# Key Findings: Daily Activity Tracking

Interesting findings:

➢ **Each** consumer in this dataset used a smart device to track their daily activities, including total steps taken, total distance walked, distance walked per activity level, total minutes spent per activity level, and total calories burned.

➢ By studying the frequency table (histogram chart) and data distribution chart (box plot) of the daily total steps for all observations in the dataset, the **following trends were found**:

  • The **most common set** of values for **daily total steps** were **between 6,000 and 8,000** steps. The **next common set** of values for **daily total steps** were **between 0 and 2,000** steps.

  • The **median** (the middle number in a sorted list of numbers) of the daily total steps was **7,396**.

  • The upper quartile (or third quartile, is the value under which 75% of data points are found when arranged in increasing order) of the box plot shows that **75%** of the values for daily total steps were **under 11,065**.

Key Findings: Daily Activity Tracking

Frequency Table for Daily TotalSteps in all obversations 4/12/2016 ~ 5/12/2016

Data Distribution for Daily TotalSteps in all Obversations 4/12/2016 ~ 5/12/2016
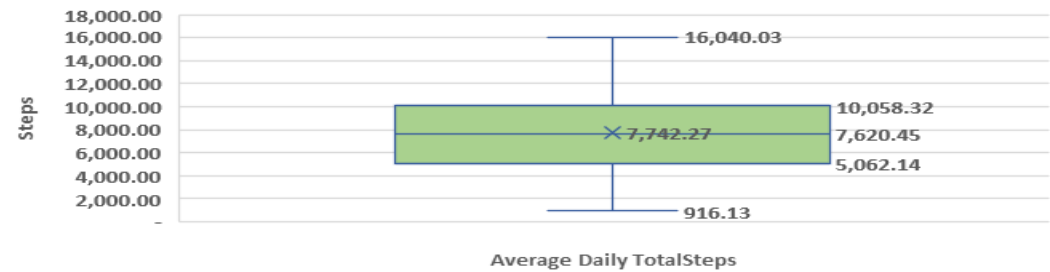
Key Findings: Daily Activity Tracking

Interesting findings:

➢ **Aggregating** the data **by consumer Id**, **the following trends were discovered**:

- Median average total daily steps per consumer is **7,620.45.**

- The upper quartile of the boxplot shows that **75% of consumers** have an average daily total step count **below 10,058.32**.

- According to this document, Walking Meeting - Preventing Chronic Disease, The Centers for Disease Control and Prevention (CDC) recommends walking **at least 10,000 steps per day**. It appears that **most consumers in this dataset were not meeting CDC recommendations.**
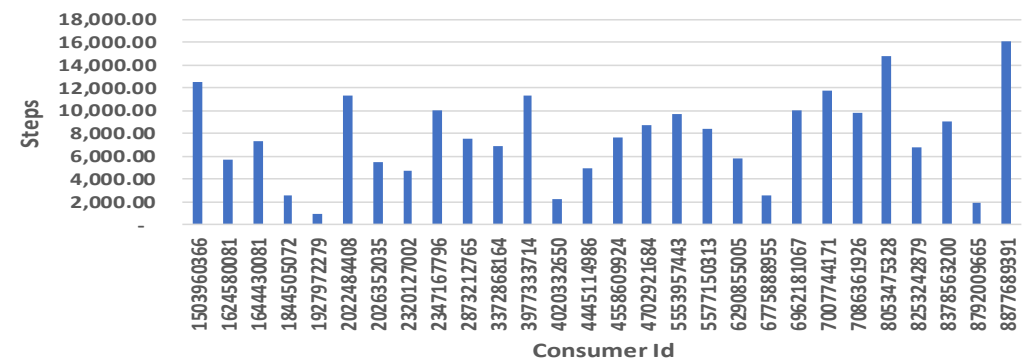
Key Findings: Daily Activity Tracking

Row Labels	Average of TotalSteps	Average of TotalDistance		
				12,520.63
				5,743.90
1503960366	12,520.63	8.07		7,282.97
1624580081	5,743.90	3.91		2,575.96
1644430081	7,282.97	5.30		916.13
1844505072	2,575.96	1.70		11,370.65
1927972279	916.13	0.63		5,456.07
2022484408	11,370.65	8.08		4,716.87
2026352035	5,456.07	3.39		10,077.18
2320127002	4,716.87	3.19		7,555.77
2347167796	10,077.18	6.73		6,861.65
2873212765	7,555.77	5.10		11,337.62
3372868164	6,861.65	4.71		2,267.23
3977333714	11,337.62	7.76		4,930.83
4020332650	2,267.23	1.63		7,685.13
4445114986	4,930.83	3.34		8,766.07
4558609924	7,685.13	5.08		9,676.31
4702921684	8,766.07	7.11		8,451.55
5553957443	9,676.31	6.34		5,851.32
5577150313	8,451.55	6.32		2,541.80
6290855005	5,851.32	4.43		10,001.73
6775888955	2,541.80	1.83		11,776.36
6962181067	10,001.73	6.73		9,766.07
7007744171	11,776.36	8.34		14,763.29
7086361926	9,766.07	6.67		6,842.28
8053475328	14,763.29	11.48		9,088.14
8253242879	6,842.28	4.93		1,919.93
8378563200	9,088.14	7.21		16,040.03
8792009665	1,919.93	1.23		
8877689391	16,040.03	13.21		
Grand Total	7,757.45	5.54		

Distribution of Data on Average Daily TotalSteps by Consumer

Average of Daily TotalSteps by Consumer

Key Findings: Daily Activity Tracking

Interesting findings:

➤ Each consumer's "activity level" was categorized based on their average number of steps taken per day and the following guidelines mentioned in the article How Many Steps a Day Is Considered Active?:

  - **Sedentary:** Less than 5,000 steps daily

  - **Low active:** About 5,000 to 7,499 steps daily

  - **Somewhat active:** About 7,500 to 9,999 steps daily

  - **Active:** More than 10,000 steps daily

  - **Highly active:** More than 12,500 steps daily

➤ The following trends where found:

  - **71%** of consumers took less than 10,000 steps per day on average (**25%** of consumers had an activity level of "**sedentary**", **21%** of consumers had an activity level of "**low active**", and **25%** of consumers have an activity level of "**somewhat active**").

Key Findings: Daily Activity Tracking

Row Labels	Average of TotalSteps	Activity Level
1503960366	12,520.63	Highly Active
1624580081	5,743.90	Low Active
1644430081	7,282.97	Low Active
1844505072	2,575.96	Sedentary
1927972279	916.13	Sedentary
2022484408	11,370.65	Active
2026352035	5,456.07	Low Active
2320127002	4,716.87	Sedentary
2347167796	10,077.18	Active
2873212765	7,555.77	Somewhat Active
3372868164	6,861.65	Low Active
3977333714	11,337.62	Active
4020332650	2,267.23	Sedentary
4445114986	4,930.83	Sedentary
4558609924	7,685.13	Somewhat Active
4702921684	8,766.07	Somewhat Active
5553957443	9,676.31	Somewhat Active
5577150313	8,451.55	Somewhat Active
6290855005	5,851.32	Low Active
6775888955	2,541.80	Sedentary
6962181067	10,001.73	Active
7007744171	11,776.36	Active
7086361926	9,766.07	Somewhat Active
8053475328	14,763.29	Highly Active
8253242879	6,842.28	Low Active
8378563200	9,088.14	Somewhat Active
8792009665	1,919.93	Sedentary
8877689391	16,040.03	Highly Active
Grand Total	**7,757.45**	

Activity Level	Count
Highly Active	3
Active	5
Somewhat Active	7
Low Active	6
Sedentary	7

Percentage of Consumers with Average Daily TotalSteps less than 10,000 is: 0.714286

Percentage of consumers per activity level

- Highly Active — 3, 11%
- Active — 5, 18%
- Somewhat Active — 7, 25%
- Low Active — 6, 21%
- Sedentary — 7, 25%

Key Findings: Daily Activity Tracking

Interesting findings:

▶ According to this article How many steps should people take per day?, most people in the United States take less than 10,000 per day. Same trend was found in the dataset we analyzed. Therefore, Bellabeat's marketing strategy should include **encouraging people to purchase and wear Bellabeat's smart devices to track/count the number of steps they take every day to ensure they achieve their goal of walking at least 10,000 steps a day.**

Key Findings: Weight and BMI Level Tracking

Interesting findings:

➤ About **24%** of consumers in the dataset (8 out of 33 consumers) used smart devices to track their **weight** and **BMI level**. The weight status of a consumer was determined by his/her BMI value. Three consumers (or **9%** of all consumers) had the weight status of "overweight," and one consumer (or **3%** of all consumers) had the weight status of "obesity."

➤ Combining consumers' daily activity information and weight information and found that:

- Of the three consumers with the "**overweight**" weight status, two were at the "**somewhat active**" activity level (an average of **5,000 to 7,499 steps per day**).

- The consumer whose weight status was "**obesity**" had the activity level of "**sedentary**" (**less than 5,000 steps per day** on average).

Key Findings: Weight and BMI Level Tracking

Row Labels	Average of TotalSteps	Activity Level	Weight Status
1503960366	12520.63333	Highly Active	Healthy Weight
1927972279	916.1290323	Sedentary	Obesity
2873212765	7555.774194	Somewhat Active	Healthy Weight
4558609924	7685.129032	Somewhat Active	Overweight
5577150313	8451.551724	Somewhat Active	Overweight
6962181067	10001.73333	Active	Healthy Weight
8877689391	16040.03226	Highly Active	Overweight
Grand Total	**9008.802817**		

# Key Findings: Weight and BMI Level Tracking

Interesting findings:

➤ According to this article "How many steps should people take per day?", a 2018 analysis of 363 people with obesity found that people who walked **10,000 steps a day**, including **at least 3,500 steps** engaging in **moderate-to-vigorous activity** lasting 10 minutes or longer, had increased weight loss.

➤ Researching deeper into the daily activity data of consumers with the weight status of either "**overweight**" or "**obesity**" and found that **only one** consumer took serious action to lose weight by walking more than 10,000 steps a day, at least 3,500 of which were at a very active level for 10 minutes or longer.

➤ Therefore, Bellabeat's marketing strategy should include **identifying people** who may have weight or BMI level concerns and encouraging them to **purchase and wear Bellabeat's smart devices to track their weight and BMI level.**

Key Findings: Weight and BMI Level Tracking

Row Labels	Average of TotalSteps	Average of VeryActiveDistance	Average of VeryActiveSteps	Average of VeryActiveMinutes	Average of WeightPounds	Average of BMI	Weight Status	Activity Level
1503960366	12,520.63	2.95	4,578.09	40.00	115.96	22.65	Healthy Weight	Highly Active
1927972279	916.13	0.10	138.44	1.32	294.32	47.54	Obesity	Sedentary
2873212765	7,555.77	0.68	993.11	14.10	125.66	21.57	Healthy Weight	Somewhat Active
4558609924	7,685.13	0.55	830.92	10.39	153.53	27.21	Overweight	Somewhat Active
5577150313	8,451.55	3.16	4,221.78	88.79	199.96	28.00	Overweight	Somewhat Active
6962181067	10,001.73	1.67	2,457.54	23.57	135.68	24.02	Healthy Weight	Active
8877689391	16,040.03	6.64	7,583.78	66.06	187.71	25.49	Overweight	Highly Active
Grand Total	9,008.80	2.24	2,955.09	34.41	159.14	25.13		

Key Findings: Weight and BMI Level Tracking

Total Steps Taken by Consumers with Weight Status "Overweight" or "Obesity" 4/12/2016 ~ 5/12/2016
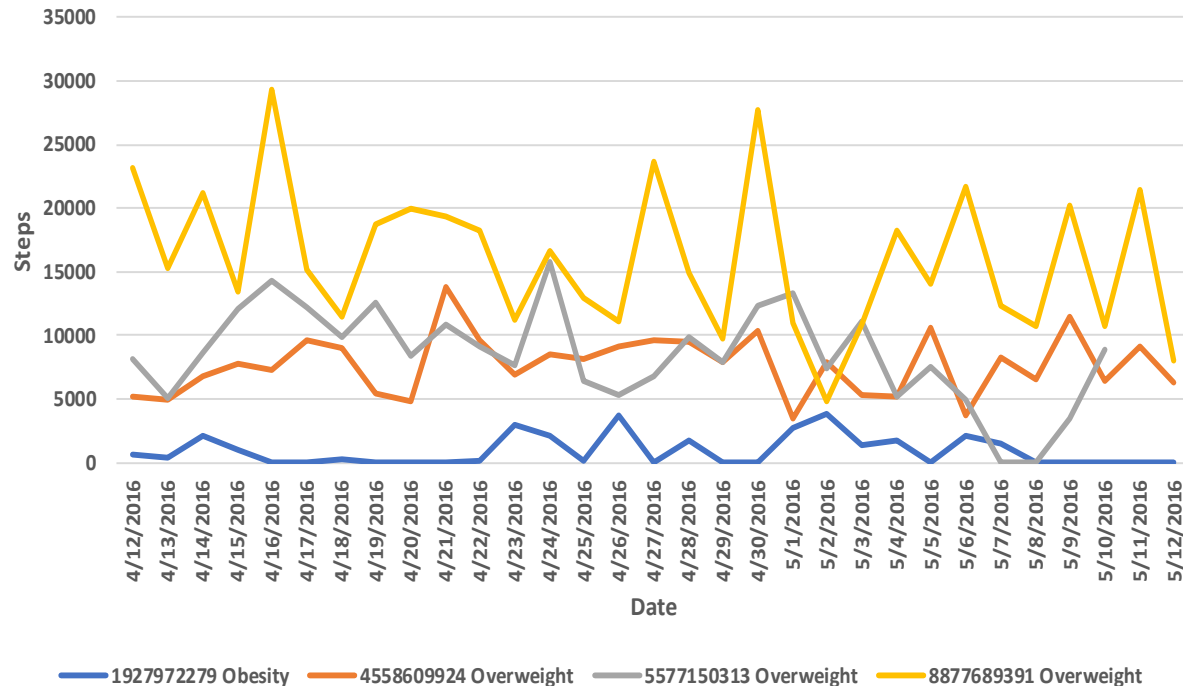
Steps Taken at Very Active Level by Consumers with Weight Status "Overweight or "Obesity" 4/12/2016 ~ 5/12/2016
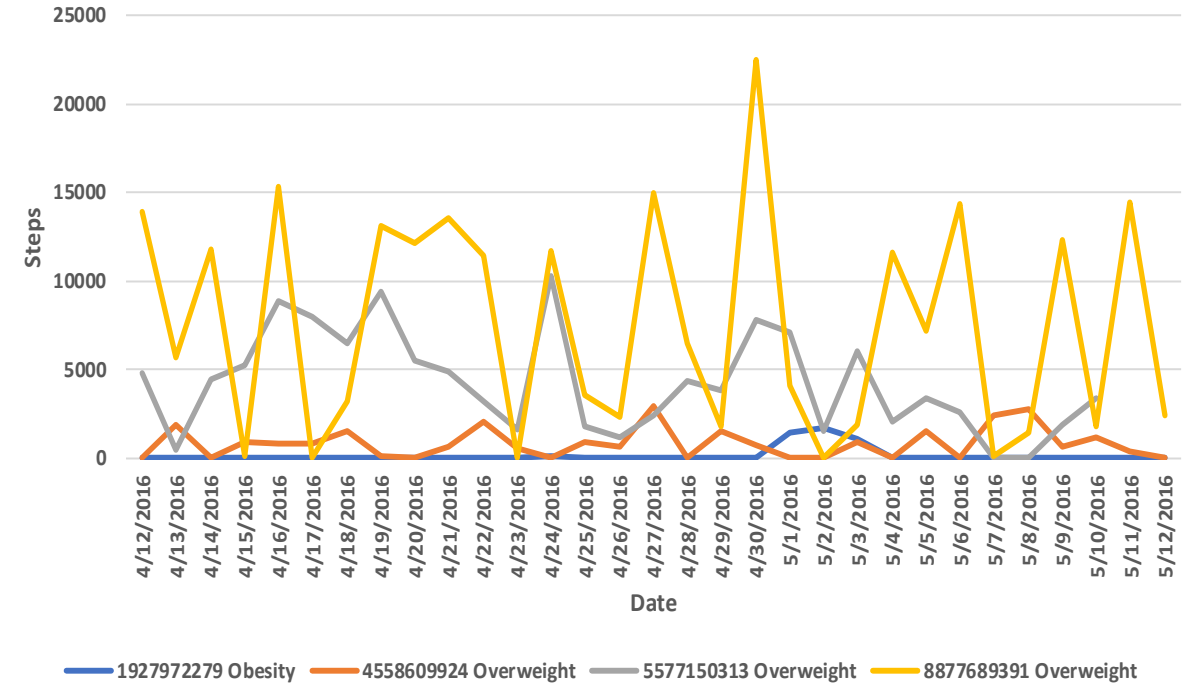
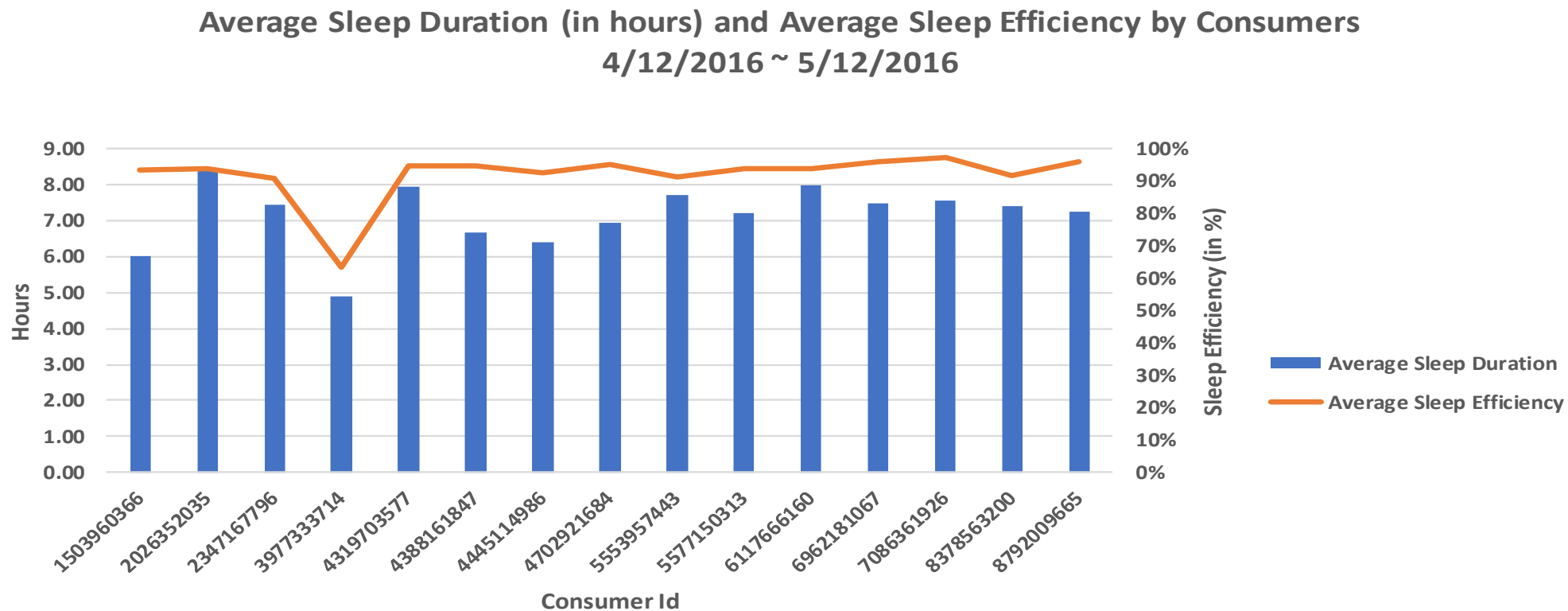# Key Findings: Sleep Duration and Sleep Efficiency Tracking

Interesting findings:

➢ Approximately **70%** of consumers in the dataset (24 out of 33 consumers) used smart device to track their sleep durations and sleep efficiencies (or total sleep minutes and total time in bed) . The following issues were found:

  ➢ **Sleep deprivation issues:** according to this article Is 6 Hours of Sleep Enough?**, consistently getting less than 6 hours of sleep can have consequences for a person's health and quality of life.** 2 consumers (or **6%** of the consumers in the dataset) slept **less than 6 hours per day** on **more than 50% of the days** during the data collection date range**.**

  ➢ **Sleep efficiency issue:** sleep efficiency is commonly defined as the ratio of **total sleep time** to **total time in bed**. A normal sleep efficiency is **85%** or higher. 1 consumer (or **3%** of the consumers in the dataset) had **poor sleep efficiency**, with an average sleep efficiency of about **63%.**

➢ For some consumers, it may be **important** to be able to **use a smart device to track their sleep durations and sleep efficiencies** and **receive alerts** when **the device detects** that the customer is **consistently getting less than 6 hours of sleep** or **has poor average sleep efficiency**.

➢ Therefore, Bellabeat's marketing strategy should include **identifying the potential buyers**, and encouraging them to **purchase and wear Bellabeat's smart devices to track their sleep durations and sleep efficiencies.**

Key Findings: Sleep Duration and Sleep Efficiency Tracking

Row Labels ▼	Average of TotalHoursAsleep	Average of SleepEfficiency	Sum of ShortSleepDay	Count of Id	Percentage of Short Sleep Day
1503960366	6.01	94%	14	25	56%
2026352035	8.44	94%	1	28	4%
2347167796	7.45	91%	0	15	0%
3977333714	4.90	63%	24	28	86%
4319703577	7.94	95%	3	26	12%
4388161847	6.67	95%	6	23	26%
4445114986	6.42	93%	8	28	29%
4702921684	6.96	95%	4	27	15%
5553957443	7.73	91%	5	31	16%
5577150313	7.20	94%	3	26	12%
6117666160	7.98	94%	2	18	11%
6962181067	7.47	96%	2	31	6%
7086361926	7.55	97%	2	24	8%
8378563200	7.42	92%	5	31	16%
8792009665	7.26	96%	2	15	13%
Grand Total	**7.14**	**0.92**	**81**	**376.00**	22%

Key Findings: Sleep Duration and Sleep Efficiency Tracking

Average Sleep Duration (in hours) and Average Sleep Efficiency by Consumers
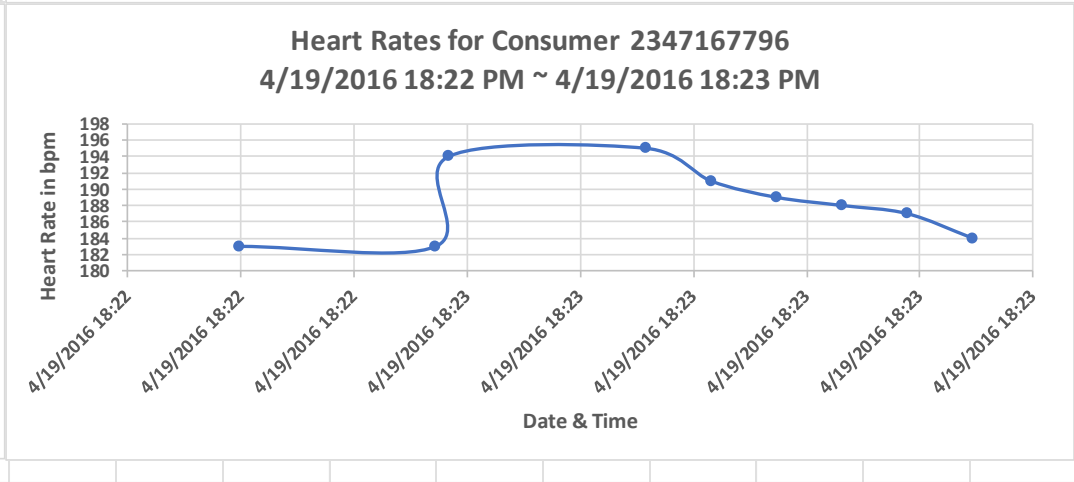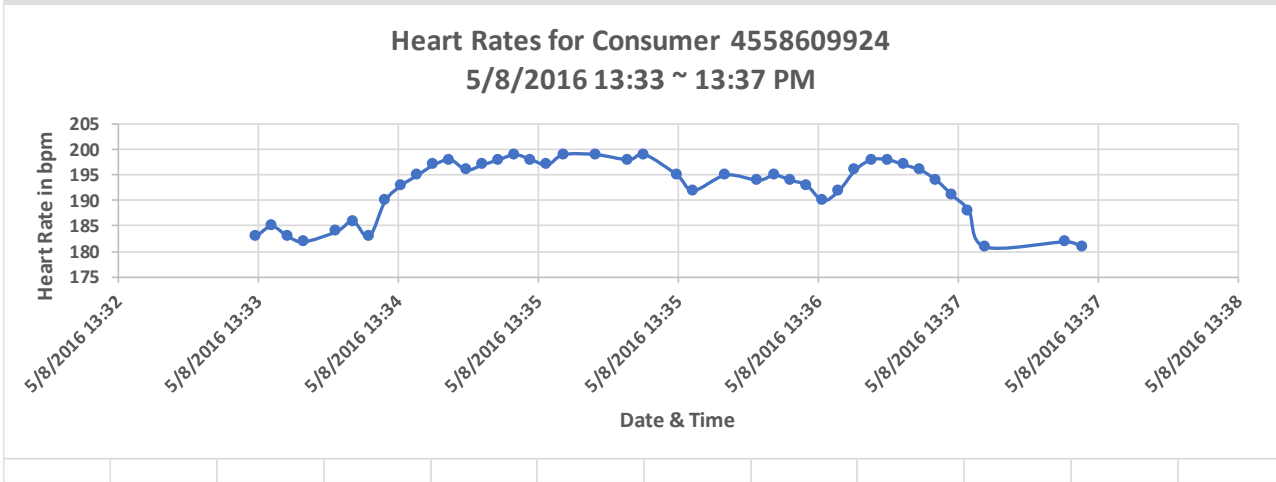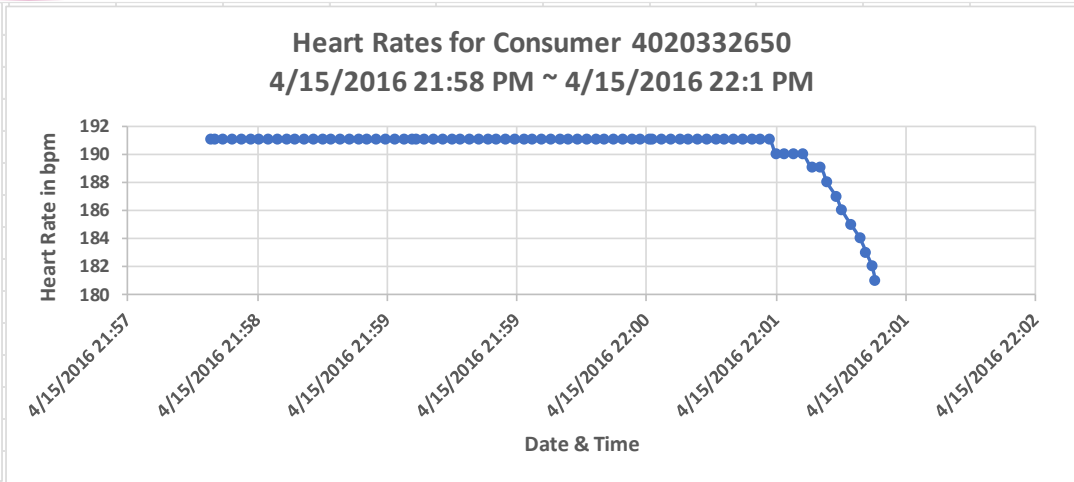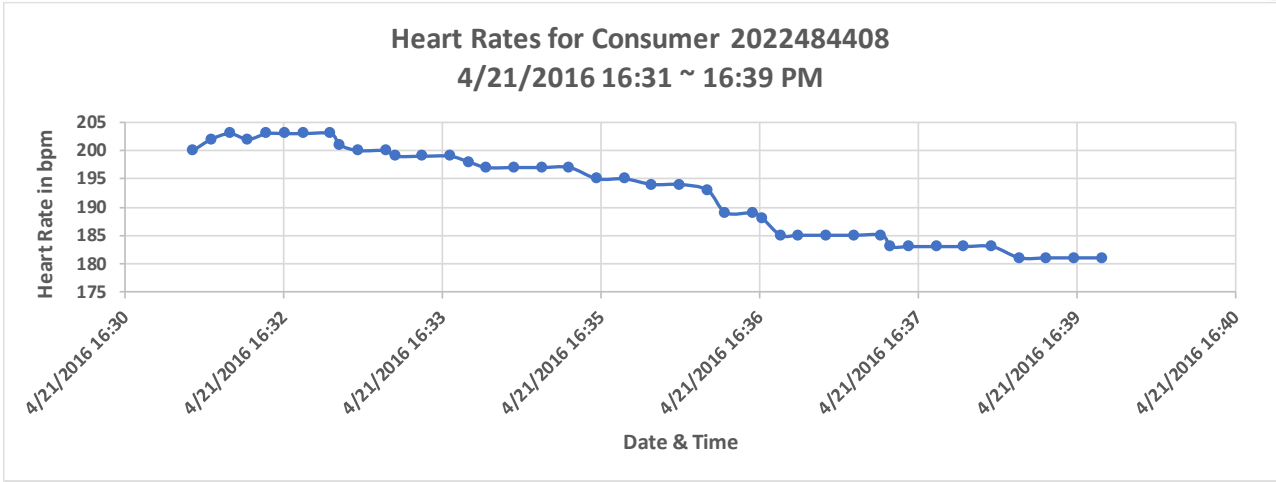4/12/2016 ~ 5/12/2016

Key Findings: Heart Rate Monitoring

Interesting findings:

➢ Approximately **20%** of consumers in the dataset (7 out of 33 consumers) used smart device to monitor their heart rates. Among them, 4 consumers (or **12%** of all the consumers in the dataset) experienced high heart rates (which were **over 180 bpm**) that lasted for several minutes.

➢ For some consumers, it may be **important** to be able to **use a smart monitoring device** and **receive alerts** when **the device detects an abnormal heart rate**.

➢ Therefore, Bellabeat's marketing strategy should include **identifying the potential buyers**, and encouraging them to **purchase and wear Bellabeat's smart devices to monitor their heart rate during walking, exercise**, etc.

Key Findings: Heart Rate Monitoring

Heart Rates for Consumer 2022484408
4/21/2016 16:31 ~ 16:39 PM

Heart Rates for Consumer 4020332650
4/15/2016 21:58 PM ~ 4/15/2016 22:1 PM

Heart Rates for Consumer 4558609924
5/8/2016 13:33 ~ 13:37 PM

Heart Rates for Consumer 2347167796
4/19/2016 18:22 PM ~ 4/19/2016 18:23 PM

Recommendations

High-level Recommendations for Bellabeat's Marketing Strategy:

Regarding monitoring customers' heart rates:

- Request the technical team to **add** **the function of monitoring customers' heart rate** on Bellabeat's smart device **Time** (if it does not already have this function). This feature might include **sending an alert** to the customer if the device **detects abnormal heart rates** (too high or too low) for several minutes.

- **Identify people who may have heart rate issues** (tachycardia or bradycardia) and **promote this feature** to them. Approximately **20% of consumers** in the dataset were interested in and **used** this feature, and **12%** of consumers in the dataset **experienced** heart rate issues, so if Bellabeat's marketing team can find potential buyers, there might be **new growth opportunities** **in this area**. Potential customers may include:

    - People with heart disease or atrial fibrillation

    - People above middle age

    - People with thyroid disease or diabetes

    - Smokers

Recommendations

High-level Recommendations for Bellabeat's Marketing Strategy:

Regarding tracking customers' weights and BMI levels:

- Request technical team to **add** the function to **track customers' weights and BMI levels** on Bellabeat's smart device **Time** (if this feature does not already exist). This feature might include **sending an alert** to the customer if the device detects that the customer's **BMI level** indicates she is **overweight or obese**, and **sending reminders** to help the customer manage her weight (e.g., **walk 10,000 steps per day**, with at least **3,500** of those steps being **moderate to vigorous**).

- **Identify people who may have weight or BMI level concerns** and **promote this feature to them**. About **20%** of consumers in the dataset were interested in and used this feature, and **12%** of consumers in the dataset were either **overweight** or **obese**, so if Bellabeat's marketing team can find potential buyers, there could be **new growth opportunities in this area**. Potential customers may include:

  - Women of certain racial groups (e.g., African-American women, Hispanic women)

  - Women of a certain age (for example, women between 40 and 59 years old)

  - Women who weigh more than 150 pounds.

Recommendations

Regarding tracking customers' daily activities

- Request the technical team to **add** the function of **tracking customers' daily activities** (including total walking steps, total walking distance, walking distance for each activity level, total minutes spent for each activity level, and total calories burned) on Bellabeat's smart device **Time** (if this feature does not already exist). This feature might include **sending reminders** to customers who take less than 10,000 steps per day.

- **Encourage everyone to purchase** Bellabeat's smart device **Time**, follow CDC's recommendation to **set a goal of 10,000 steps each day**, and **track the daily activity using Time**. **Every** consumer in the dataset was interested in and used this feature, but at least **70%** of consumers in the dataset took less than 10,000 steps per day. If Bellabeat's marketing team can properly motivate buyers, there could **be a lot of growth** in this area.

Recommendations

High-level Recommendations For Bellabeat's Marketing Strategy:

Regarding tracking customers' sleep durations and sleep efficiencies:

- Request the technical team to **add the function to track customers' sleep durations and sleep efficiencies** (or total sleep minutes and total time in bed) on Bellabeat's smart device **Time** (if this feature does not already exist). This functionality may include **sending an alert** to the customer if the device detects that the customer is **consistently getting less than 6 hours of sleep** or **has poor average sleep efficiency**.

- **Identify people who may have sleep deprivation or sleep efficiency issues and promote this feature** to them. About **70%** of the consumers in the dataset were interested in and used this feature, at least **6%** of the consumers in the dataset had sleep deprivation issues, and at least **3%** of the consumers in the dataset had sleep efficiency issues. If Bellabeat's marketing team can find potential buyers, there might be **some growth in this area**. Potential customers may include:

  - Elderly women

  - Women who need to take care of their families and spend time working

  - Women with chronic illness

  - Women who frequently experience menstrual stress or pain