bellabeat

Data Analysis Report

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Executive Summary

Overview

- This report analyzes smart device usage data to uncover **key trends** that inform **Bellabeat's marketing strategy**.
- By examining user data related to activity, sleep, and weight, the goal is to find:
  - **What are some trends in smart device usage?**
  - **How could these trends apply to Bellabeat customers?**
  - **How could these trends help influence Bellabeat's marketing strategy?**

Tools

- **SQL (SQL Server Management Studio)**: By utilizing SQL concepts such as CTEs, Window Functions, Views, and JOINs, the data can be efficiently transformed for tasks like data cleaning, filtering, and merging.
- **Excel**: With Excel features like Pivot Tables, Power Query, VLOOKUP, and Nested IF functions, reports can showcase data modeling, KPIs, visualizations, and interactive dashboards.

Recommendation

- **Moderate Activity**: Most users take 4,000 to 11,999 steps daily, indicating moderate activity levels, with higher activity being less common but still notable.
- **Sleep Improvement**: Bellabeat should focus on promoting sleep tracking and mindfulness features to help users improve their weekday sleep habits.
- **Hydration for Weight Loss**: Promote 'Spring Water Bottle' as a key tool for weight management, emphasizing hydration's role in controlling hunger and boosting metabolism for overweight users.
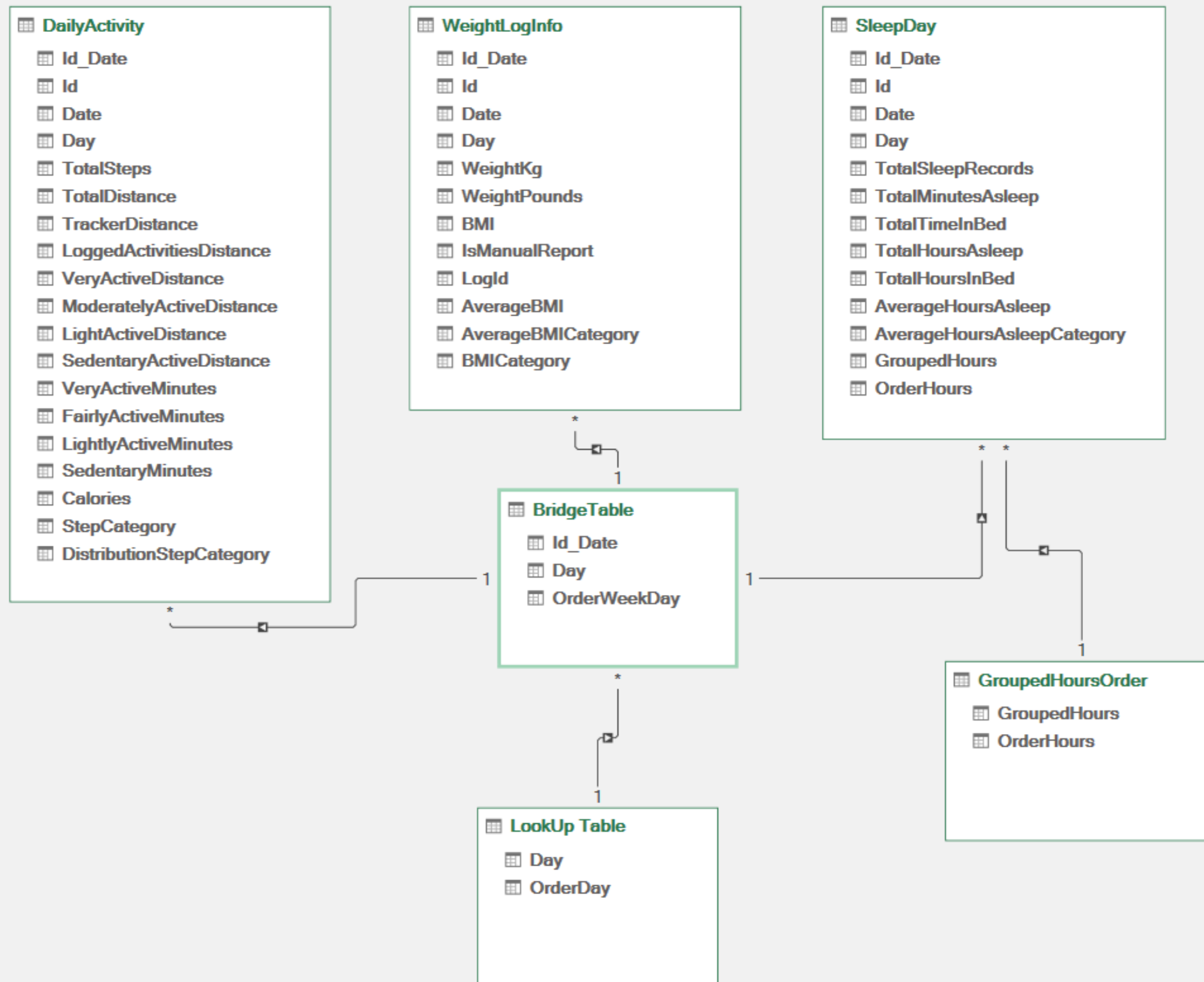
Data Transformation

```sql
448  -- There are 3 duplicated rows in SleepDay table. Let's remove them.
449  WITH CTE AS (
450      SELECT
451          *,
452          ROW_NUMBER() OVER( -- Use Row_number to figure out the duplicate values
453              PARTITION BY
454                  Id,
455                  Date,
456                  TotalSleepRecords,
457                  TotalMinutesAsleep,
458                  TotalTimeInBed
459              ORDER BY
460                  Id
461          ) AS UniqueRowNumber
462      FROM
463          GoogleProject..SleepDay
464  )
465  DELETE FROM CTE
466  WHERE
467      UniqueRowNumber > 1;
```

```sql
536  ALTER TABLE GoogleProject..SleepDay
537  ADD TotalHoursAsleep NUMERIC(10, 1),
538      TotalHoursInBed  NUMERIC(10, 1);
539
540  UPDATE GoogleProject..SleepDay
541  SET
542      TotalHoursAsleep = ROUND(CAST(TotalMinutesAsleep / 60.0 AS NUMERIC(10, 1)), 1),
543      TotalHoursInBed  = ROUND(CAST(TotalTimeInBed / 60.0 AS NUMERIC(10, 1)), 1);
544
545
546  SELECT
547      *
548  FROM
549      GoogleProject..SleepDay;
```

```sql
763  USE GoogleProject;
764  GO
765
766  CREATE TABLE WeekActivitySleep (
767      Days VARCHAR(50),
768      AverageTotalSteps NUMERIC(10, 2),
769      AverageTotalHoursAsleep NUMERIC(10, 2),
770      WeekOrder AS (
771          CASE
772              WHEN Days = 'Monday'    THEN 1
773              WHEN Days = 'Tuesday'   THEN 2
774              WHEN Days = 'Wednesday' THEN 3
775              WHEN Days = 'Thursday'  THEN 4
776              WHEN Days = 'Friday'    THEN 5
777              WHEN Days = 'Saturday'  THEN 6
778              WHEN Days = 'Sunday'    THEN 7
779          END
780      ) PERSISTED
781  );
782
783  INSERT INTO WeekActivitySleep (
784      Days,
785      AverageTotalSteps,
786      AverageTotalHoursAsleep
787  )
788  SELECT
789      COALESCE(wa.Days, ws.Days) As Days,
790      wa.AverageTotalSteps AS AverageTotalSteps,
791      ws.AverageTotalHoursAsleep AS AverageTotalHoursAsleep
792  FROM
793      GoogleProject..WeekActivity AS wa
794  FULL OUTER JOIN
795      GoogleProject..WeekSleep AS ws
796      ON wa.Days = ws.Days
```

Data Model

DailyActivity
- Id_Date
- Id
- Date
- Day
- TotalSteps
- TotalDistance
- TrackerDistance
- LoggedActivitiesDistance
- VeryActiveDistance
- ModeratelyActiveDistance
- LightActiveDistance
- SedentaryActiveDistance
- VeryActiveMinutes
- FairlyActiveMinutes
- LightlyActiveMinutes
- SedentaryMinutes
- Calories
- StepCategory
- DistributionStepCategory

WeightLogInfo
- Id_Date
- Id
- Date
- Day
- WeightKg
- WeightPounds
- BMI
- IsManualReport
- LogId
- AverageBMI
- AverageBMICategory
- BMICategory

SleepDay
- Id_Date
- Id
- Date
- Day
- TotalSleepRecords
- TotalMinutesAsleep
- TotalTimeInBed
- TotalHoursAsleep
- TotalHoursInBed
- AverageHoursAsleep
- AverageHoursAsleepCategory
- GroupedHours
- OrderHours

BridgeTable
- Id_Date
- Day
- OrderWeekDay

LookUp Table
- Day
- OrderDay

GroupedHoursOrder
- GroupedHours
- OrderHours

Key Highlights

- **One-To-Many relationships:** Links key tables, which will allow multiple records in the BridgeTable to correspond to a single entry in the connected data tables.

- **BridgeTable**: This centralizes data from DailyActivity, WeightLogInfo, and SleepDay using shared identifiers like ID, Date, and Day for integrated and streamlined analysis.

- **LookUp Table & GroupedHoursOrder**: Provides additional reference and categorization, facilitating ordered day mapping and sleep hour grouping for enhanced analysis.

KPIs

KPIs

Day	Average Sleep (hours)	Target Sleep (hours)	Difference	Performance	Performance Indicator
Monday	7	7.5	-0.5	Below Target	🔴
Tuesday	6.76	7.5	-0.74	Below Target	🔴
Wednesday	7.25	7.5	-0.25	Below Target	🔴
Thursday	6.7	7.5	-0.8	Below Target	🔴
Friday	6.77	7.5	-0.73	Below Target	🔴
Saturday	6.99	7.5	-0.51	Below Target	🔴
Sunday	7.56	7.5	0.06	On Target	🟢
Total/Average	49.03	52.5	-3.47	Below Target	🔴

Day	Average Steps	Target Steps	Difference	Performance	Performance Indicator
Monday	7780	8000	-220	Below Target	🔴
Tuesday	8125	8000	125	On Target	🟢
Wednesday	7559	8000	-441	Below Target	🔴
Thursday	7405	8000	-595	Below Target	🔴
Friday	7448	8000	-552	Below Target	🔴
Saturday	8152	8000	152	On Target	🟢
Sunday	6933	8000	-1067	Below Target	🔴
Total/Average	53402	56000	-2598	Below Target	🔴

Key Highlights

- **Weekday Sleep Deficit**: The participants consistently sleep below the 7.5-hour target on weekdays. The resulting performance shows that insufficient rest could negatively affect productivity and health.

- **Weekend Recovery**: The participants slightly exceed the sleep target on Sunday, suggesting an attempt to recover from the weekday sleep deficit.

- **Weekday Steps Shortfall**: Step counts fall below the 8,000 target on most weekdays, likely due to a sedentary routine or limited time for exercise.

- **Inconsistent Weekend Activity**: While the user exceeds the step target on Saturday and Tuesday, Sunday shows a significant drop in activity with a deficit of 1,067 steps, indicating inconsistent weekend activity.

- **Note**: Recent study suggest that walking **7,500 to 8,000 steps daily** is linked **to longer life expectancy**, implying that it is not necessary to reach 10,000 steps per day to gain health benefits. (Rogers, 2023)

Data Analysis (Activity)

Distribution of Daily Steps Among Participants

Percentage of Total Steps in Each Category
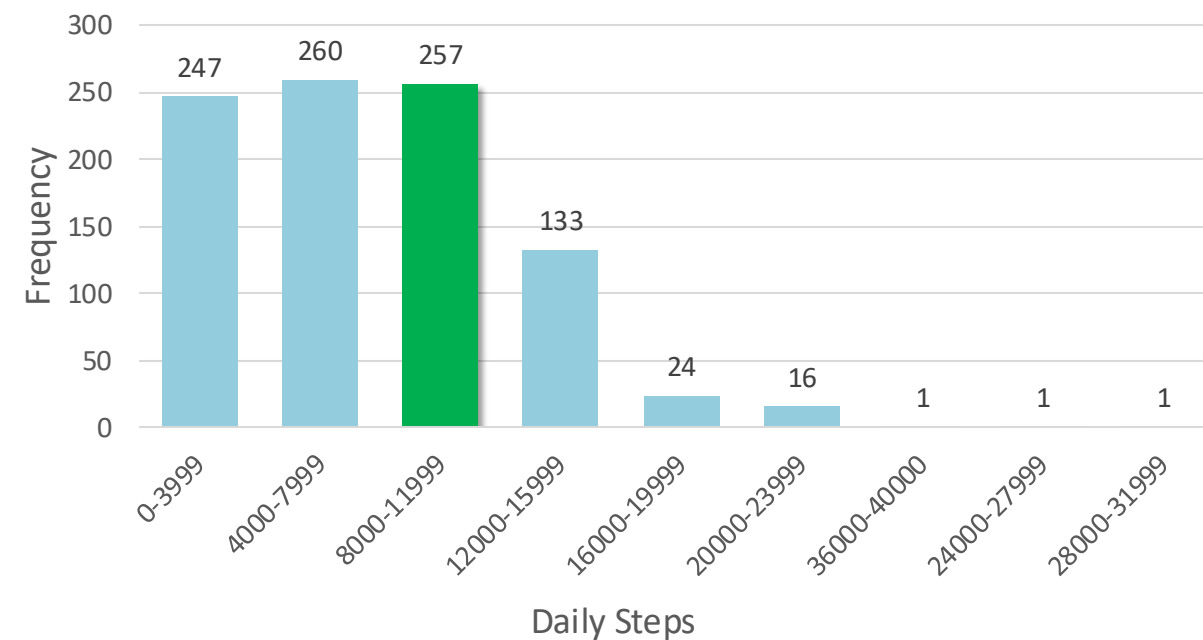
- **Moderate Activity is Most Frequent**: The step ranging between 4,000 and 11,999 steps were the most frequent, with users logging 260, 257, and 247 instances, respectively. This suggests that most users regularly maintain a moderate level of daily activity.

- **High Activity Occurs Often**: The 12,000–15,999 step range has a notable frequency of 133 instances, showing that users frequently reach high activity levels, which could indicate consistent engagement in fitness activities.

- **Moderate Activity**: 21.28% of participants take 7,000-10,000 steps, indicating moderate activity levels.

- **Low Activity**: 46.49% take fewer than 7,000 steps, suggesting a need for BellaBeat to encourage more daily activity.

- **High Activity**: 32.23% exceed 10,000 steps, showing a significant portion is highly active, which BellaBeat can promote as a goal for others.

Data Analysis (Sleep)

Distribution of Sleep Duration

Average Sleep Duration per Participants by Category
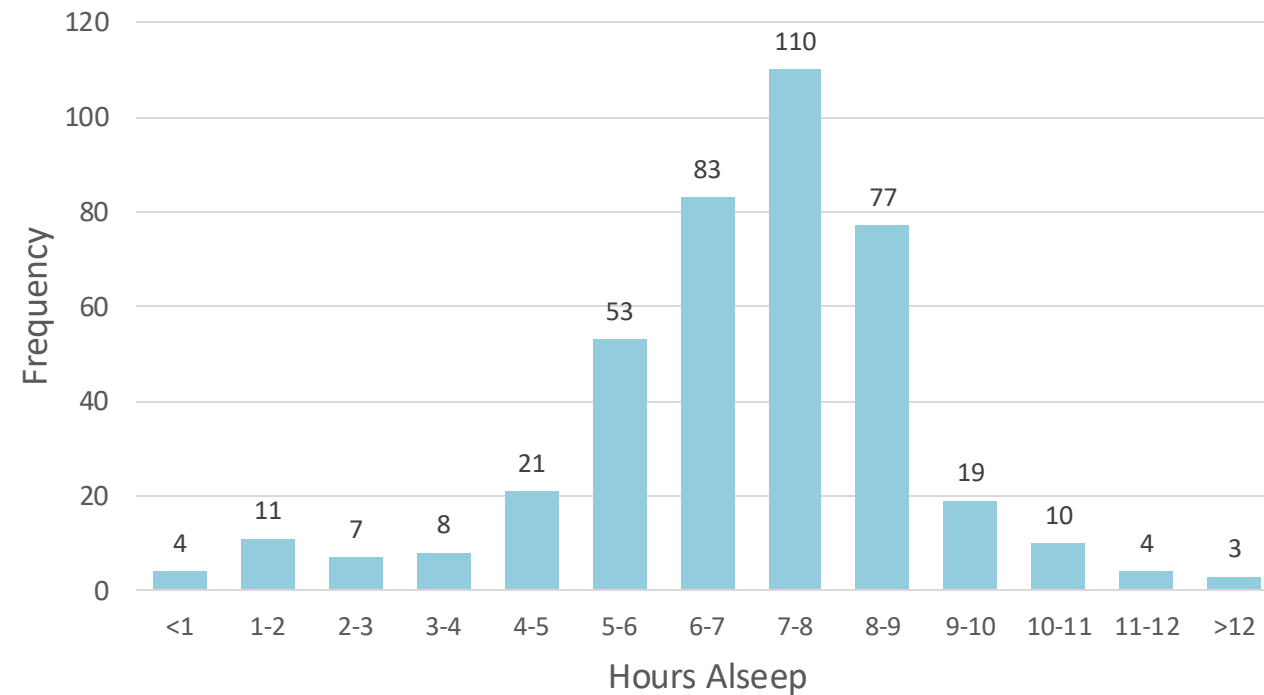
- **7-8 Hours is Most Recorded**: With 110 occurrences, 7-8 hours is the most frequently recorded sleep duration. This time range aligns with recommended sleep guidelines. (NIH, 2022)
- **6-9 Hours is Often Recorded Also**: The bars indicating 6-7 hours (83 occurrences) and 8-9 hours (77 occurrences) are also high, indicating that these sleep durations are recorded frequently, even if maybe only by a few people.

- **Lack of Sleep is Prevalent**: While it may seem most people are getting adequate sleep, the data from the previous graph shows irregularly recorded data over a certain period of time. Depending on who recorded many times and who didn't, the data became askew. When the average of this data is taken in hopes to level out the discrepancies, it shows that 13 out of the 24 participants experienced insufficient sleep, indicating a common issue within the group.
- **Balanced Sleep is Achievable**: Still, 10 participants maintained healthy sleep habits, proving that sufficient sleep is very attainable.

Data Analysis (Weight)

Distribution of Body Mass Index records

Average BMI per Participants by Category
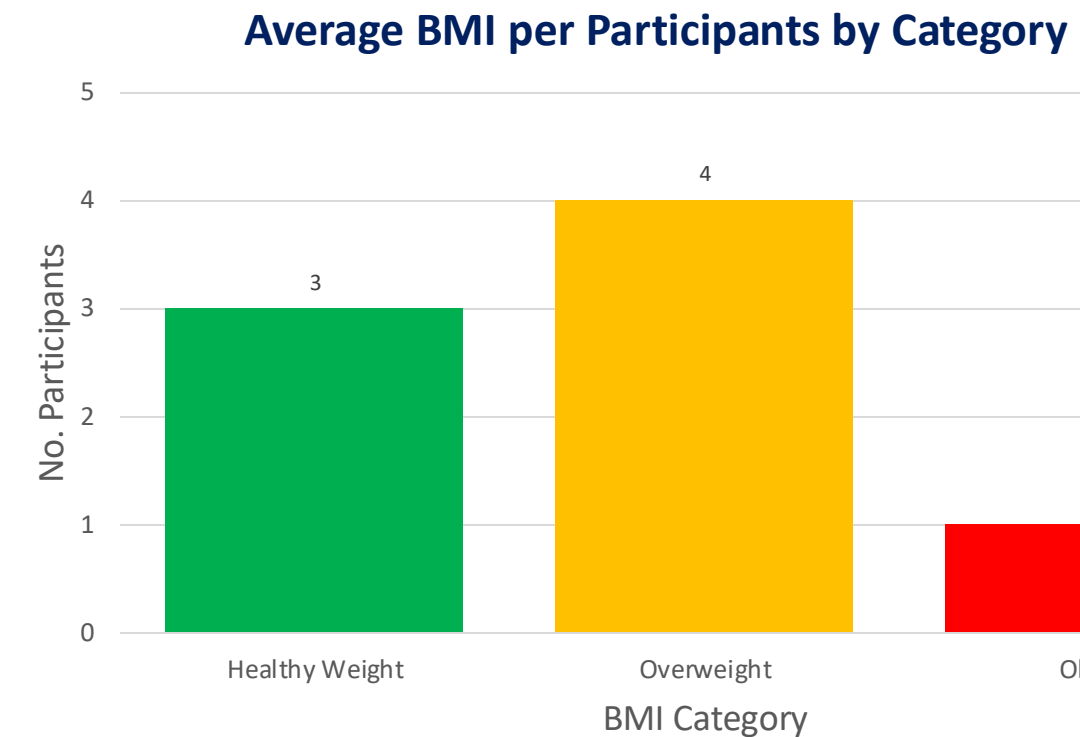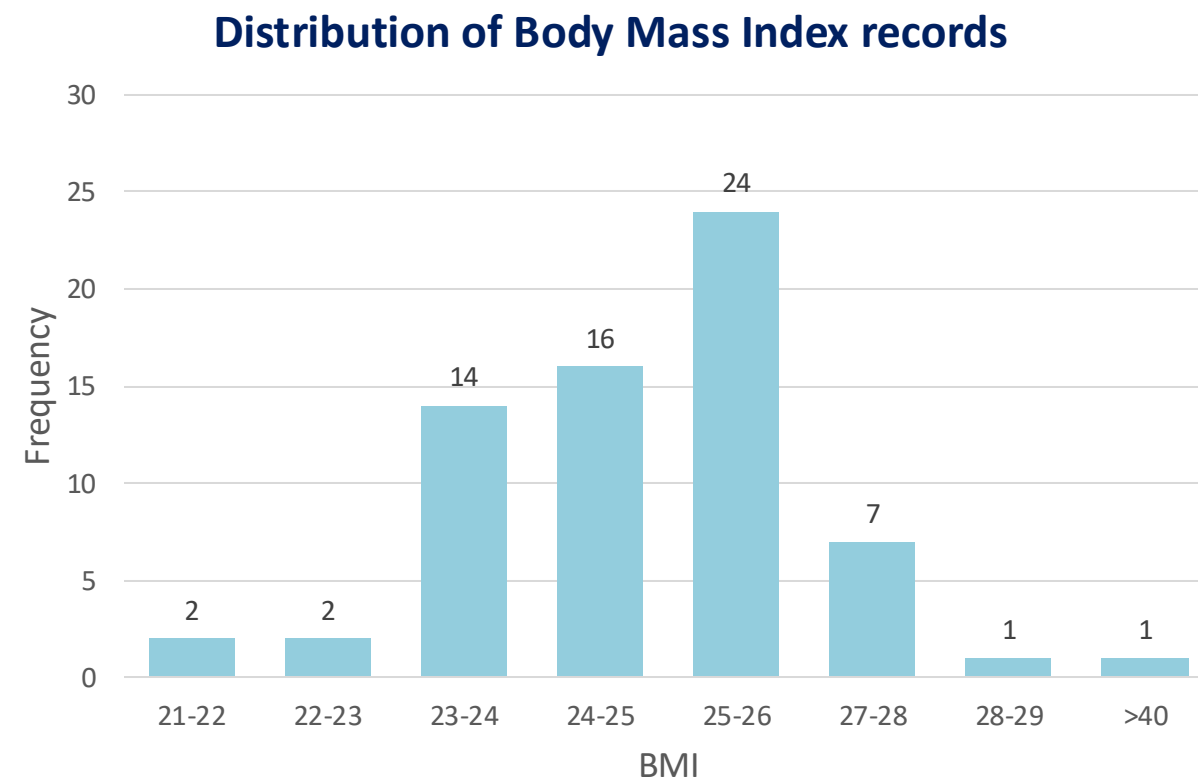
- **Most Frequent BMI Range is 25-26**: The 25-26 BMI range has the highest frequency, indicating that users frequently check their BMI when it falls in the "overweight" category.
- **Moderate BMI Ranges are Common**: BMI ranges between 23-25 and 24-25 also have significant data, suggesting that users often monitor their BMI around the normal-to-overweight threshold.
- **Note**:

  - BMI < 18.5 = Underweight.   - BMI > 25 = Overweight
  - BMI > 30 = Obesity (WHO, 2024)

- **Overweight Category is Most Common**: The largest number of participants, 4 out of 8, fall into the "Overweight" BMI category, indicating this is the most prevalent group.
- **Healthy Weight is Significant**: 3 participants are classified as having a "Healthy Weight," showing that a substantial proportion of the group maintains a normal BMI.

Data Analysis

Total Steps VS Calories

Very Active Minutes VS Calories
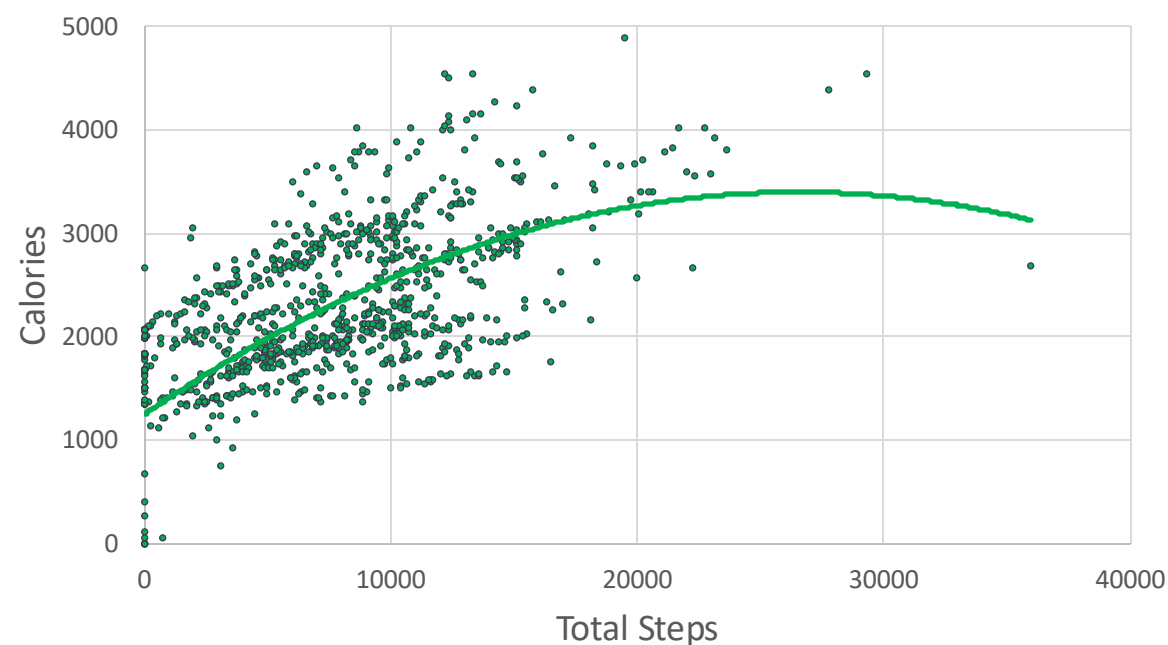
- **Positive Correlation**: There is a positive correlation between total steps and calories burned, meaning that in general, more steps are associated with higher calorie expenditure.
- **Strong Data Integrity**: While there are a **few outliers**, they are not extreme, which indicates the data integrity is relatively strong.
- **Participant Clustering**: Most participants cluster around **10,000 steps** and burn between **2,000 to 3,000 calories**.

- **Positive Relationship**: There is a positive relationship between very active minutes and calories burned, indicating that more intense activities like running or biking result in higher calorie expenditure.
- **Participant Clustering**: Most participants cluster around **0 to 50 very active minutes**, with calories burned ranging between **2,000 to 3,000 calories**.
- **Calorie Burn Plateau**: After 150 minutes of intense activity, additional exercise offers diminishing calorie benefits.

Data Analysis

Total Time In Bed VS Total Time Asleep

SedentaryMinutes VS TotalMinutesAsleep
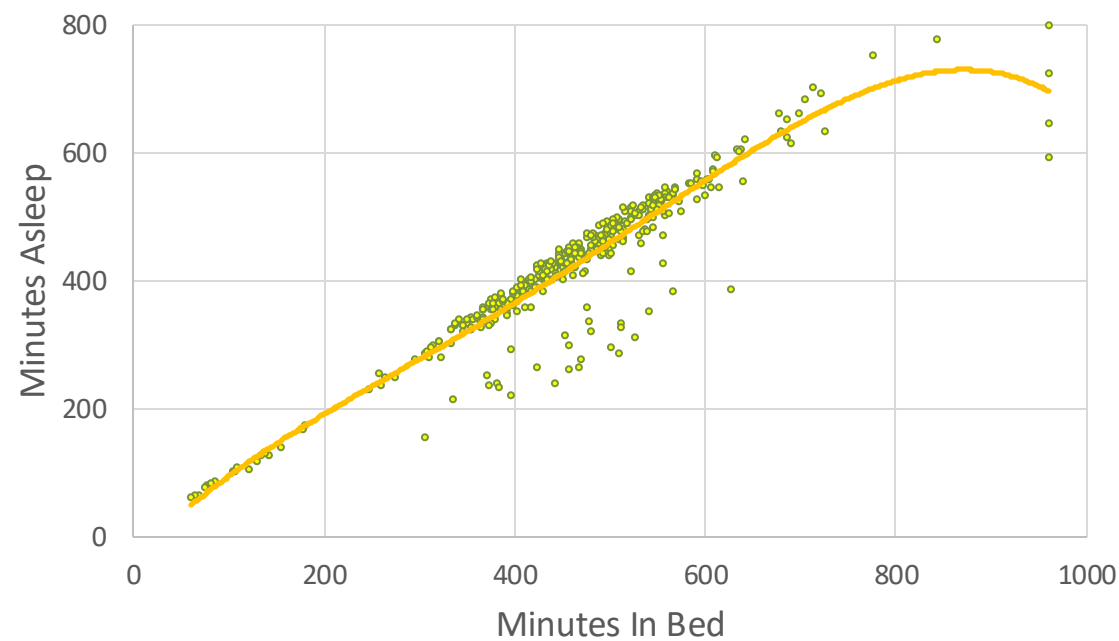
- **Positive Correlation**: There is a strong positive correlation between total time in bed and total time asleep, meaning that as participants spend more time in bed, they tend to sleep longer.
- **Sleep Plateau: After 600 minutes in bed**, the increase in sleep time begins to **plateau**, indicating that spending more time in bed beyond this point does not lead to significantly longer sleep duration.

- **Non-linear Relationship**: Sleep initially increases with sedentary time but declines after 600 minutes.
- **Optimal Sedentary Range**: Participants with 400-600 sedentary minutes get the most sleep, suggesting moderate sedentary time improves sleep.
- **Negative Impact of Excessive Sedentary Time**: After 600 sedentary minutes, sleep duration sharply decreases, indicating a negative effect of excessive sedentary behavior on sleep.

Recommendation

01

During weekdays, users consistently sleep below the target of 7.5 hours. Bellabeat can provide personalized recommendations for **improving weekday sleep**, promoting products such as their **Time Wellness Watch** or **Leaf Tracker**, which monitor sleep and stress levels.

02

According to the pie chart, 46.49% of the users take less than 7,000 steps daily. Bellabeat should push notifications or suggestions via their **Bellabeat app** to encourage these users to **increase their daily activity**. Personalized challenges or reminders to move could be effective strategies for this user segment.

03

Since 13 participants fall into the "Lack of Sleep" category, Bellabeat can create targeted campaigns focused on improving sleep quality. The **Bellabeat app's** sleep tracking and mindfulness features can be emphasized, **offering personalized suggestions** for users struggling with insufficient sleep. Promoting the importance of sufficient rest could resonate well with this large segment.

Recommendation

04

The majority of participants are in the Overweight category (4). Hydration is crucial for this group because it aids weight management by controlling hunger, boosting metabolism, and improving health. Bellabeat can promote the **Spring Water Bottle** as a key tool for weight loss, offering **personalized hydration goals** and reminders through the app to help users in these categories stay on track with their water intake and weight goals.

05

Correlation graphs suggest that increasing total steps is useful but very active minutes result in more efficient calorie burn. Bellabeat can market a **balanced fitness approach** where users are encouraged to achieve a combination of both **steps** and **high-intensity activities**. Campaigns could focus on promoting features like heart rate monitoring and intensity tracking via **Leaf** and **Time**, which would appeal to users interested in both moderate and high-intensity workouts.

06

Other Correlation graphs highlight the importance of a balanced lifestyle. Bellabeat should market a holistic wellness approach through its product ecosystem, combining **activity tracking with sleep optimization**. Campaigns can focus on how **Leaf** and **Time** help users balance their daily activities and rest, emphasizing that good sleep requires healthy daytime and nighttime habits

Conclusion

Business Objective

➢ Identify smart device usage trends

➢ Apply insights to Bellabeat customers' behavior

➢ Develop marketing strategies to boost engagement and wellness

Actionable Insights

➢ Promote hydration for weight management using the Spring Water Bottle

➢ Use Bellabeat apps to enhance sleep features to address user sleep deficits

➢ Encourage high-intensity activities for optimal calorie burn via Leaf, and Time products

Key Findings

➢ 50% of users fall into overweight/obese categories

➢ Insufficient sleep is common among users

➢ Active minutes strongly correlate with calorie burn

Recommendations

➢ Target users with high BMI through hydration-focused campaigns

➢ Offer personalized sleep improvement content

➢ Highlight active minutes in marketing for better fitness engagement

THANKS FOR WATCHING!
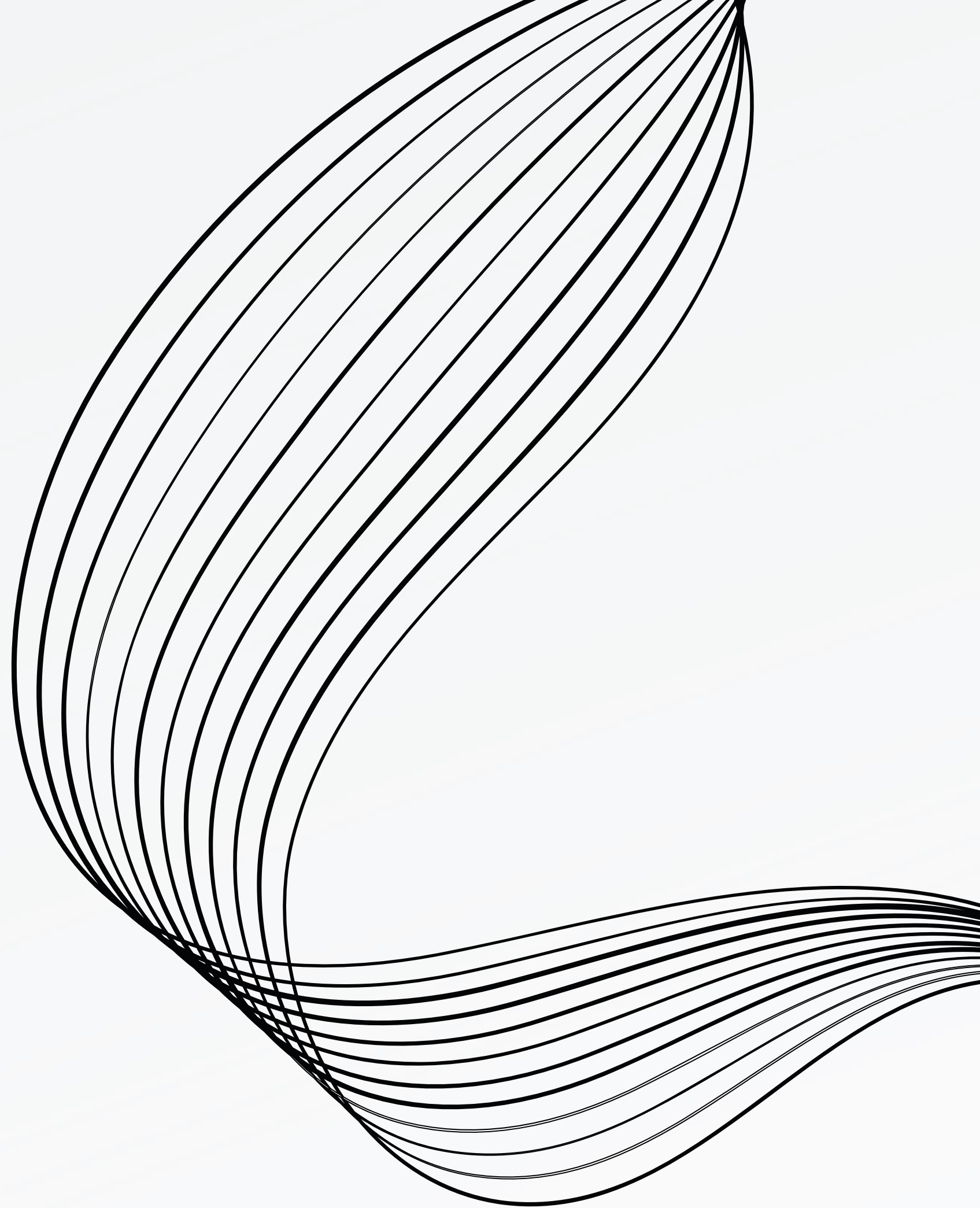
References

National Heart, Lung, and Blood Institute (NIH) (2022) *How much sleep is enough?* 24 March. Available at:

        https://www.nhlbi.nih.gov/health/sleep/how-much-sleep (Accessed: 10 September 2024).

Rogers, M. (2023) *Do you actually need to walk 10,000 steps a day?* Blue Cross and Blue

        Shield of North Carolina, 13 March. Available at: https://www.bluecrossnc.com/blog/healthy-living/fitness/walk-10000-steps-a-day (Accessed: 10 September

        2024).

World Health Organization (WHO) (2024) *Body mass index (BMI)*. Available at: https://www.who.int/data/gho/data/themes/topics/topic-details/GHO/body-mass-index

        (Accessed: 10 October 2024).

Appendix 1 (Dashboard)

Appendix 2 (Dashboard)

KPIs

Day	Average Sleep (hours)	Target Sleep (hours)	Difference	Performance	Performance Indicator
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Saturday	8152	8000	152	On Target	
Sunday	6933	8000	-1067	Below Target	
Total/Average	53402	56000	-2598	Below Target	

Activity

Row Labels	Count of TotalSteps
0-3999	29
4000-7999	35
8000-11999	33
12000-15999	18
16000-19999	3
20000-23999	2
Grand Total	120

Row Labels	Count of TotalSteps
Less than 7,000	44.17%
7,000 - 10,000	22.50%
More than 10,000	33.33%
Grand Total	100.00%

Weight

Row Labels	Count of BMI
22-23	1
23-24	1
24-25	3
25-26	3
27-28	4
Grand Total	12

Row Labels	Count of AverageBMI
Healthy Weight	3
Overweight	4
Obese	1
Grand Total	8

Sleep

Row Labels	Count of TotalHoursAsleep
<1	1
1-2	1
3-4	1
4-5	4
5-6	4
6-7	9
7-8	11
8-9	14
>12	1
Grand Total	46

Row Labels	Count of AverageTotalHoursAsleep
Lack of Sleep	13
Sufficient Sleep	10
Excessive Sleep	1
Grand Total	24

Appendix 3 (Dashboard)

Appendix 4 (Dashboard)

Activity

TotalSteps	Calories
13162	1985
10735	1797
10460	1776
9762	1745
12669	1863
...	...
...	...
10686	2847
20226	3710
10733	2832
21420	3832
8064	1849

VeryActiveMinutes	Calories
25	1985
21	1797
30	1776
29	1745
36	1863
...	...
...	...
17	2847
73	3710
18	2832
88	3832
23	1849

Sleep

TotalTimeInBed	TotalMinutesAsleep
346	327
407	384
442	412
367	340
712	700
...	...
...	...
360	343
527	503
423	415
545	516
463	439

Activity Sleep

SedentaryMinutes	TotalMinutesAsleep
728	327
776	384
726	412
773	340
539	700
...	...
...	...
749	343
834	503
916	415
739	516
848	439