Increase the amount of miles I walk per day

Process owner: Kyle Welch

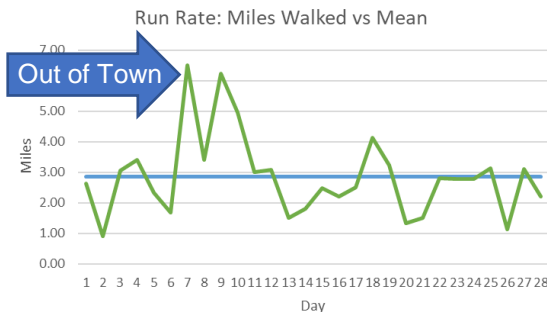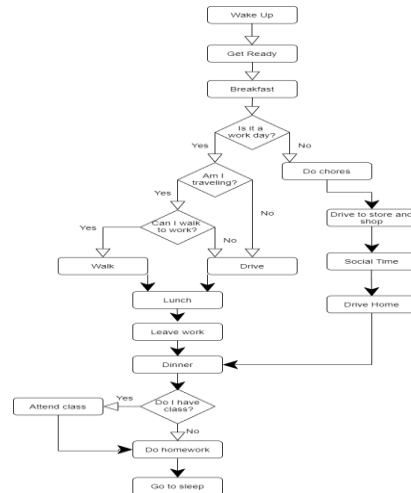| Key Dates --->	Team Launch	1/12/2020	Define	1/15/2020	Measure	1/20/2020	Analyze	2/17/2020	Improve	2/24/2020	Control	3/16/2020

DEFINE

Problem Statement:
The objective of this project is to identify a solution to the problem of increasing the number of miles I walk in a day.
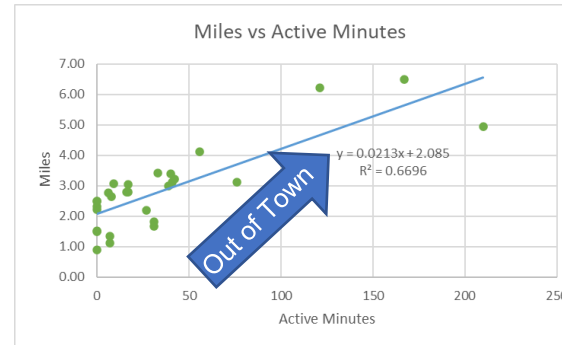
Business Impact:
The health risk of not increasing my walking could lead to approximately **$19,050** in medical expenses. Additionally, my healthcare provider offers benefits for healthy habits such as walking that could earn me an additional **$120** annually. Increasing walking is potentially a total net benefit of **$19,170**

Performance Measure	Continous or discrete?	Data Source and Location	How Will Data Be Collected	Who Will Collect Data	When will Data Be Collected	Target Sample Size
How many miles I walked on a given day	Continous	Fitbit, myself	Pull from Fitbit data	Myself	2/17/2020	28 Days
How many calories I burned on a given day	Continous	Fitbit, myself	Pull from Fitbit data	Myself	2/17/2020	28 Days
Minutes spent "Active" on a given day. Fitbit tracks active minutes at or above 3 metabolic equivalent; activitie such as a brisk walk or *purposeful* walking	Continous	Fitbit, myself	Pull from Fitbit data	Myself	2/17/2020	28 Days
Time Spent on Lunch	Continous	Myself	Time monitoring/recording when on Lunch and when off	Myself	Continuously	28 Days
Time Spent Commuting, driving to and from work, store, etc.	Continous	Myself	Time monitoring/when commute started and ended	Myself	Continuously	28 Days
Time Spent Being Social, can include walking but not *purposeful* walking	Continous	Myself	Time monitoring/when began socializing and stopped	Myself	Continuously	28 Days
The temperature at noon at my location on a given day	Discrete	Android Weather App	Pull from Android Weather data	Myself	Continuously	28 Days
Was I out of town on a given day	Discrete	Myself	Yes or No, myself	Myself	Continuously	28 Days
Did I have to work on a given day	Discrete	Myself	Yes or No, myself	Myself	Continuously	28 Days
Did I have class on a given day	Discrete	Myself	Yes or No, myself	Myself	Continuously	28 Days

MEASURE

Run Rate: Miles Walked vs Mean

Out of Town

SQL: 1.5

ANALYZE

Miles vs Active Minutes

$y = 0.0213x + 2.085$
$R^2 = 0.6696$

Out of Town

Scatter Plot of Miles related to Active Minutes. Produces formula of y=0.0213x + 2.085 and has a correlation coefficient of r= 0.8. Active Minutes accounts for 67% of miles walked variability.

Solution	Difficulty	Process Impact	Complexity	Score
Go out of town more often	5	5	5	15
Reduce time spent commuting	4	3	3	10
Reduce time on lunch	2	2	1	5
Reduce social time	1	1	1	3
Increase active minutes	3	1	2	6
Go out town more often	Spend more time out of town.			
Reduce time spent commuting	Spend less time commuting to walk.			
Reduce time on lunch	Spend less time on lunch to walk.			
Reduce social time	Spend less time being social to walk.			
Increase active minutes	Use reduced times to increase active minutes			

When I was out of town I had the highest peak in miles walked and active minutes, however going out of town more often is unfeasible. Reducing commute time would be difficult and unlikely. Reduce social and lunch time as much as possible and convert into active minutes.

IMPROVE

Miles Walked		
Measure of Center	Measure	Improve
Mean	2.85	4.00
Median	2.78	3.95
Mode	No Mode	2.94
Measure of Variability	Measure	Improve
Range	5.60	4.18
ST Dev	1.34	1.05
Variance	1.79	1.11
SQL:	1.5	2.3

Measure of center shows that the "improve" data set mean and median both increased by over a mile walked a day compared to the "measure" data set. The improve data set also has a lower range, standard deviation, and variance as the process was improved and standardized.

CONTROL

- Continue to use reduced time spent on lunch and social to walk.

- Continue to increase active minutes by going on brisk walks with increase available time.

- Aim to walk 4 miles daily.

- ## **Problem Statement**
  - The objective of this project is to identify a solution to the problem of increasing the number of miles I walk in a day. The amount of walking I do daily has decreased since I began working a full-time job and being a full-time student. I have noticed health side effects in my daily life due to the decreased amount of walking I currently do. An increase in the number of miles that I walk daily will lead to a reversal of these side effects and an overall healthier lifestyle.

- ## **Business Impact**
  - Currently, on average I walk between two to three miles a day. According to Harvard, walking reduces the risk of a cardiovascular event by 31%, the Centers for Disease Control and Prevention estimates the cost of a cardiovascular event at $18,200 for the average American. A cardiovascular event can lead to up to a one-week hospital stay. If I had to take unpaid time off from my job because I was in the hospital recovering from a heart attack, it could cost me up to one week's worth of my salary, approximately $850. Another potential benefit of walking more is that my insurance offers gift cards for healthy behaviors through a mobile app called Engage. A limit of two $5 visa gift cards per month that are earned for every 100,000 steps walked, a maximum of $120 over a year. I currently walk approximately 5,000 steps daily which equates roughly to one gift card per month. If I walked an extra mile daily, approximately 2,000 steps, by the end of the month I would walk about 210,000 steps and could redeem a second gift card. By walking an extra mile a day, I would lead a healthier lifestyle, while earning money and potentially avoiding medical bills. The net total dollars that walking could save me is approximately $19,170

Goal, Project Scope, & Plan

- **Goal**
  - The goal of this project is to increase the amount I walk by an average of 1 mile a day.

- **Project Scope**
  - The scope of this project does not have any set boundaries as the increase to the distance I walk will be tracked everyday of the week, all hours of the day.

- **Project Plan**
  - 1/15/2020: Define (Identify the problem and the team's scope)
  - 1/20/2020: Measure (Develop data collection plan and implement it)
  - 2/17/2020: Analyze (Determine root causes; identify and verify critical variables
  - 2/24/2020: Improve (Develop/select/pilot and then implement a solution)
 - 3/16/2020: Control (Put a control plan in place, ensure the problem stays fixed)

Performance Measure	Continous or discrete?	Data Source and Location	How will Data Be Collected	Who Will Collect Data	When will Data Be Collected	Target Sample Size
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Did I have to work on a given day	Discrete	Myself	Yes or No, myself	Myself	Continuously	28 Days
Did I have class on a given day	Discrete	Myself	Yes or No, myself	Myself	Continuously	28 Days

- For this process improvement project I am tracking 10 variables from several different collection sources.
  - Miles walked, calories burned, and active minutes were tracked via wearing a Fitbit tracker during this project.
  - Time spent on lunch, commuting, and being social were tracked by time monitoring at the beginning and ending of each occurrence.
  - Temperature was recorded at noon at my location via the android weather app.
  - Am I out of town, have work, and have class are all yes or no binary variables.
- All variables will be tracked continuously by myself, except for the Fitbit variables which will all be pulled at once when it is time for analysis.
- The target sample size is 28 days or 28 data points. This is the target sample size because it is the largest possible sample size, I can record while still having time analyze the data and record another sample with the improvement in place.

| Day	Miles	CalBurned	Active Minutes	Time On Lunch	Time On Commute	Social Minutes	Temp	OutOfTown?	WorkDay?	ClassDay?
1	2.63	3019	8	60	53	65	30	0	1	0
2	0.90	2678	0	60	56	51	32	0	1	1
3	3.05	3386	17	60	50	41	36	0	1	0
4	3.41	3467	33	58	52	49	43	0	1	0
5	2.32	3198	0	58	53	64	48	0	1	0
6	1.67	3094	31	30	33	95	46	0	0	0
7	6.50	4931	167	45	92	138	66	1	0	1
8	3.40	3707	40	45	54	94	72	1	1	0
9	6.22	4185	121	45	47	102	70	1	1	1
10	4.95	4435	210	45	47	147	73	1	1	0
11	3.00	3399	39	30	52	44	72	1	1	0
12	3.07	3257	9	59	56	57	43	0	1	0
13	1.51	2781	0	32	29	172	41	0	0	0
14	1.81	3303	31	27	32	175	45	0	0	1
15	2.48	3280	0	58	54	62	52	0	1	0
16	2.21	3017	0	48	59	37	46	0	1	1
17	2.50	2967	0	51	61	38	43	0	1	0
18	4.12	3401	56	60	56	63	37	0	1	0
19	3.22	3156	42	53	50	43	54	0	1	0
20	1.34	2810	7	31	36	141	41	0	0	0
21	1.50	2735	0	25	0	158	43	0	0	1
22	2.80	3107	17	60	50	38	45	0	1	0
23	2.79	3241	16	50	51	72	45	0	1	1
24	2.77	3118	6	60	56	56	43	0	1	0
25	3.12	3274	41	60	47	66	41	0	1	0
26	1.12	2698	7	49	58	64	30	0	1	0
27	3.11	3322	76	37	27	106	27	0	0	0
28	2.20	3152	27	34	0	111	41	0	0	1
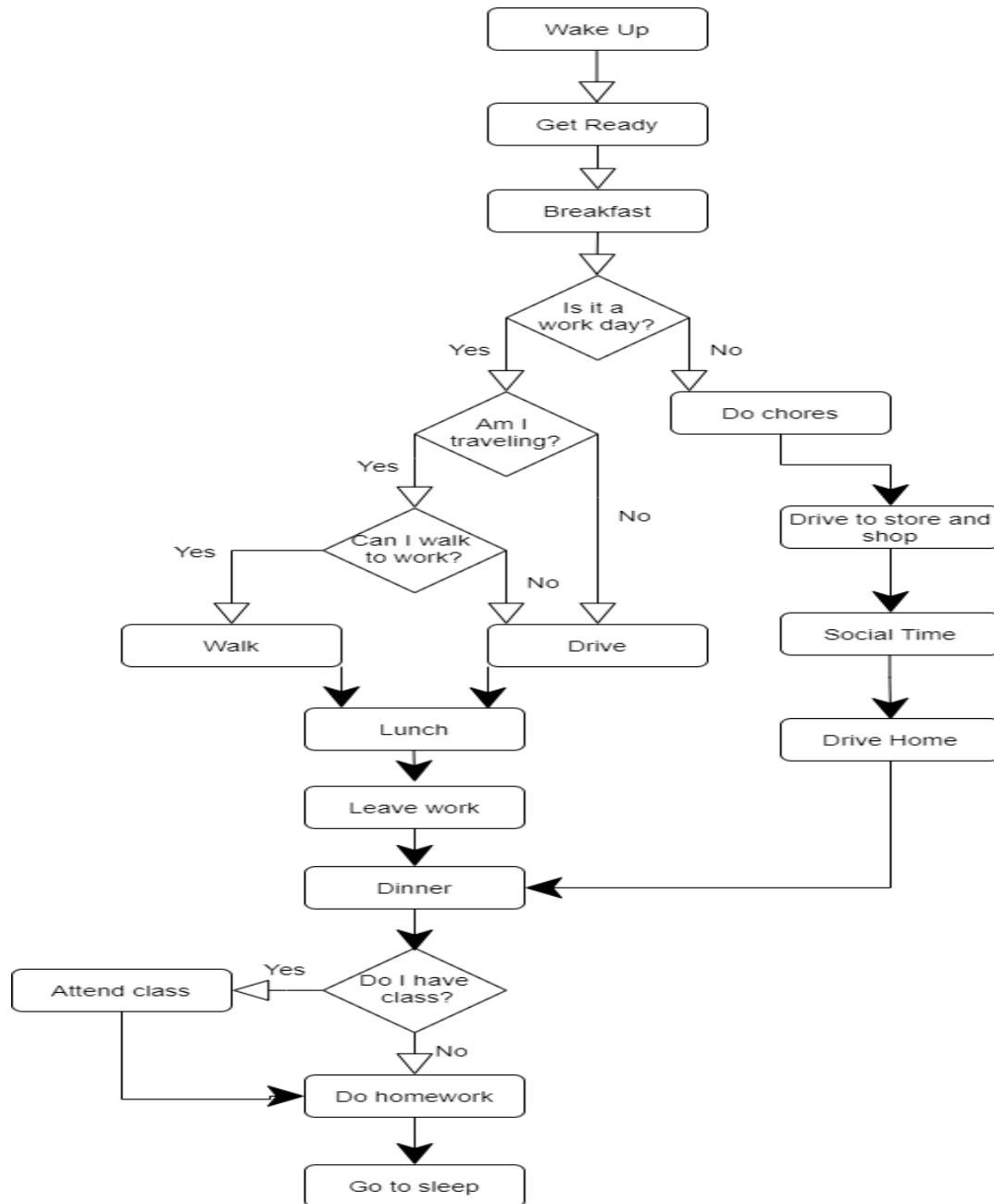
- The process map to the left details an average day of my life. Binary variables, such as, am I working, am I traveling, and do I have class, affect how my day will go.

- There are multiple times throughout the day where I am non-active that I could instead be walking. Specifically, during my commute, during lunch, and time I spend being social. These are three potential variables that could be reduced to in turn increase the miles I walk daily.

Run Rate: Miles Walked vs Mean
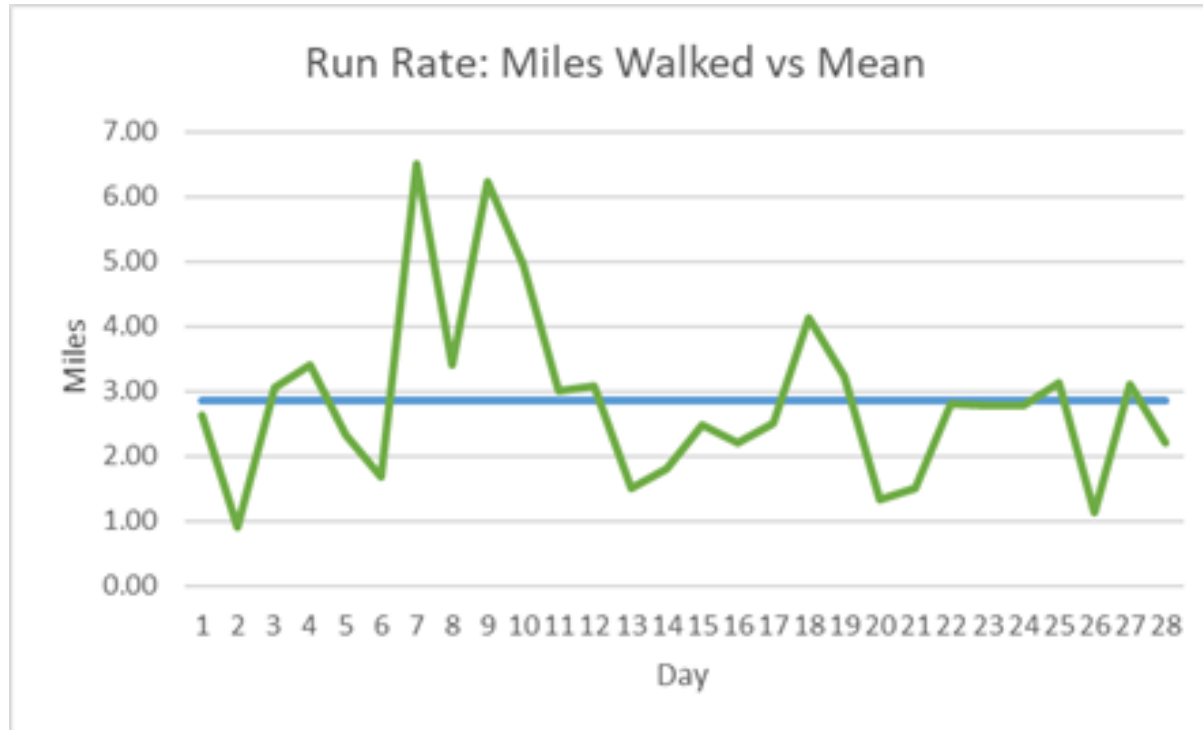
- The graph on the left shows a green line, this is the run rate of miles I walked during the 28-day sample size.

- The blue horizontal line is the average miles I walked during the 28-day sample, 2.85 miles.

- Most of the data points seem to fall below the mean line, with only 11 out of 28 of the points greater than the average.

- The two days where I walked the most amount of miles happened while I was out of town and was able to walk more outside of my normal routine.

- My goal for the process improvement project is to walk on average a mile more a day, or 3.85 miles daily. During this sample size only 4 points occurred at 3.85 or greater.

	Measure Data	Improve Data
Defect Opportunities	275	275
Units Produced Per Day	36	50
Total Possible Defects Per Day	9900	13750
Total Actual Defects	4990	2922
Defect Per Opportunity Rate	50.40%	21.25%
DPMO	504040.40	212509.09
Sigma Quality Level	**1.5**	**2.3**

- Defect opportunities was calculated using the max daily time spent not being active, 275.

- Units produced per day is the average active time in each sample, 36 for the measure data and 50 for the improve data.

- Total Possible Defects Per Day: Defect Opportunities * Units Produced Per Day.

- Total Actual Defects: Sum of all minutes spent not being active in each sample.

- Defect Per Opportunity Rate: Total Actual Defects / Total Possible Defects Per Day.

- DPMO: Defect Per Opportunity Rate * 1,000,000.

- Measure SQL: 1.5

- Improve SQL: 2.3

Miles vs Active Minutes

$$y = 0.0213x + 2.085$$
$$R^2 = 0.6696$$
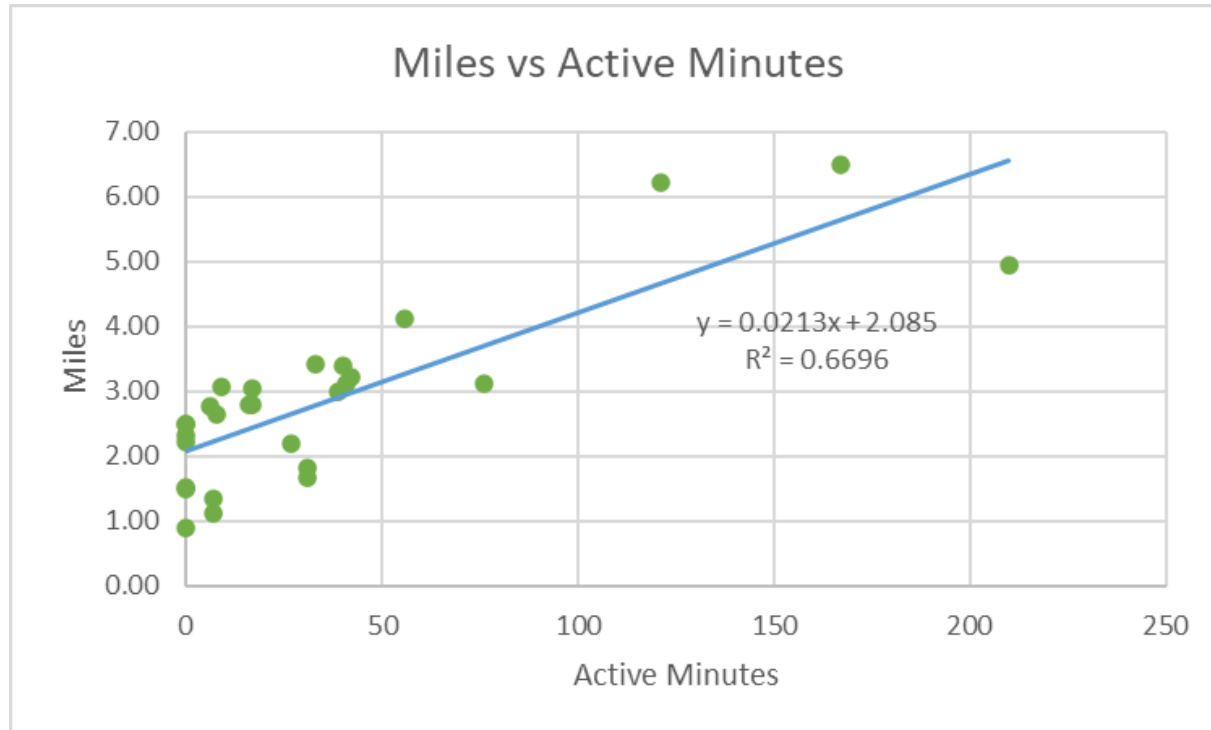
- The scatter plot on the left plots active minutes (x) and miles walked (y). As the active minutes increase, typically, so do miles walked. There is an 0.8 correlation between these two variables. Active Minutes accounts for 0.67 of miles walked variability.

- The equation for the trendline data of this scatter plot is y=0.0213x + 2.085. Meaning that I walk about 2.1 miles a day without being active, and for every minute I spend being active I walk about 0.02 more miles.

Solution	Difficulty	Process Impact	Complexity	Score
Go out of town more often	5	5	5	15
Reduce time spent commuting	4	3	3	10
Reduce time on lunch	2	2	1	5
Reduce social time	1	1	1	3
Increase active minutes	3	1	2	6
Go out town more often	Spend more time out of town.			
Reduce time spent commuting	Spend less time commuting to walk.			
Reduce time on lunch	Spend less time on lunch to walk.			
Reduce social time	Spend less time being social to walk.			
Increase active minutes	Use reduced times to increase active minutes			

- After analyzing the data there were five variables I chose to focus on to determine a solution and implement and improvement.

- The largest spikes in miles walked came when I was out of town. Unfortunately, because of budget, time, work, school, etc. it is unfeasible to go out of town on any kind of regular basis. Going out of town more often was determined to be the most difficult solution to implement.

- Reducing time spent commuting, at lunch, or being social are much more likely variables to be able to improve. Commuting the most difficult of the three because only change I can truly make is leaving at more optimal times. Most of my time reductions will come from lunch and being social.

- Increasing active minutes becomes much more possible by reducing time spent elsewhere and using that time to take brisk walks.

| Day	Miles	CalBurned	Active Minutes	Time On Lunch	Time On Commute	Social Minutes	Temp	OutOfTown?	WorkDay?	ClassDay?
1	4.66	4420	161	42	47	52	30	1	1	0
2	4.2	3845	19	42	46	55	45	1	1	1
3	6.6	5364	307	43	42	74	28	1	1	0
4	4.58	4261	84	43	50	60	21	1	1	0
5	3.56	3589	27	44	43	45	30	1	1	0
6	2.94	3299	31	29	29	70	45	0	0	0
7	3.6	3212	11	24	0	83	52	0	0	1
8	3.52	3472	48	40	43	51	55	0	1	0
9	4.65	3772	66	47	53	56	52	0	1	1
10	2.67	2897	34	38	52	41	50	0	1	0
11	4.02	3747	30	38	51	46	43	0	1	0
12	3.58	3312	25	46	49	60	41	0	1	0
13	4.24	3972	33	25	32	124	37	0	0	0
14	4.64	3374	26	32	0	103	43	0	0	1
15	2.82	3089	8	45	46	47	54	0	1	0
16	2.42	3081	19	41	43	46	55	0	1	1
17	5.83	4050	46	40	57	47	55	0	1	0
18	5.18	3654	32	38	50	42	48	0	1	0
19	3.44	3122	16	46	54	54	48	0	1	0
20	2.94	3212	15	33	26	89	46	0	0	0
21	3.95	3301	17	26	0	62	52	0	0	1

Miles Walked		
Measure of Center	Measure	Improve
Mean	2.85	4.00
Median	2.78	3.95
Mode	No Mode	2.94
Measure of Variability	Measure	Improve
Range	5.60	4.18
ST Dev	1.34	1.05
Variance	1.79	1.11

- To measure the improvement in miles walked, I compared the measure of center and measure of variability from each data set. The improve data does show an increase in the average miles walked by over one mile per day. This is true when comparing both the mean and median from both data set.

- The range, standard deviation, and variance all shrink for the improve data set as well. The process became more standardized by reducing non-active time and increasing active time. The standardization of my process allows me to walk in more similar time patterns that leads me to consistently walk around the same amount daily.

Run Rate: Miles Walked vs Mean

Miles Walked vs Active Minutes

$y = 0.0104x + 3.4815$
$R^2 = 0.4445$
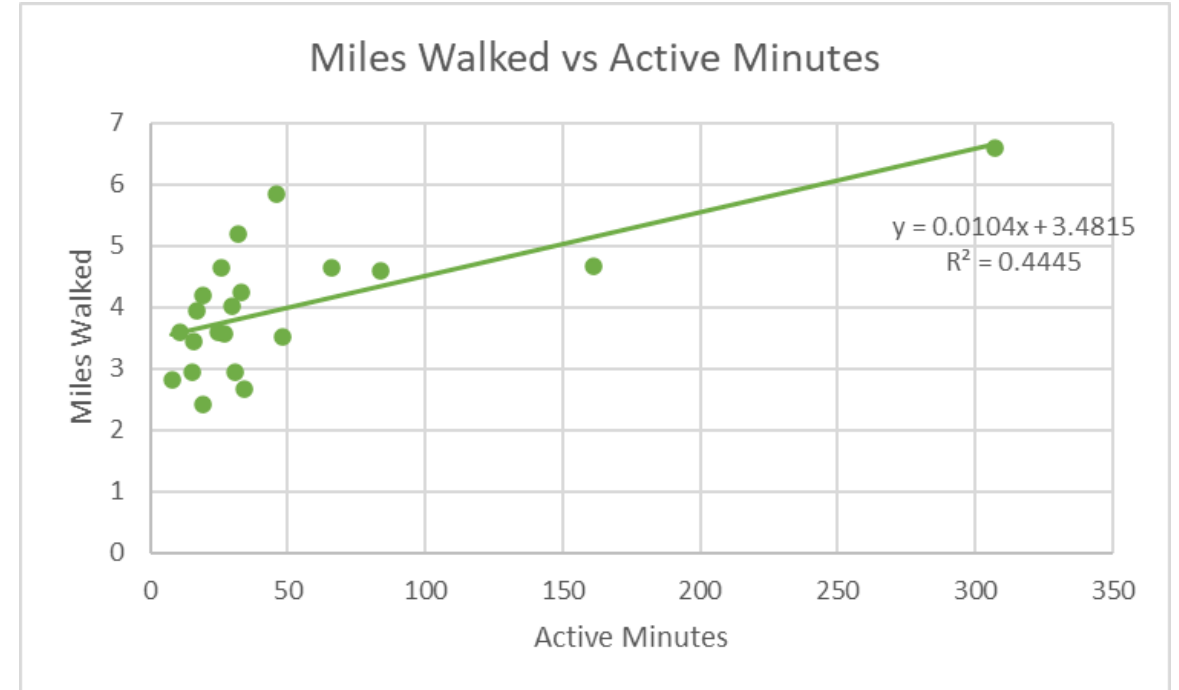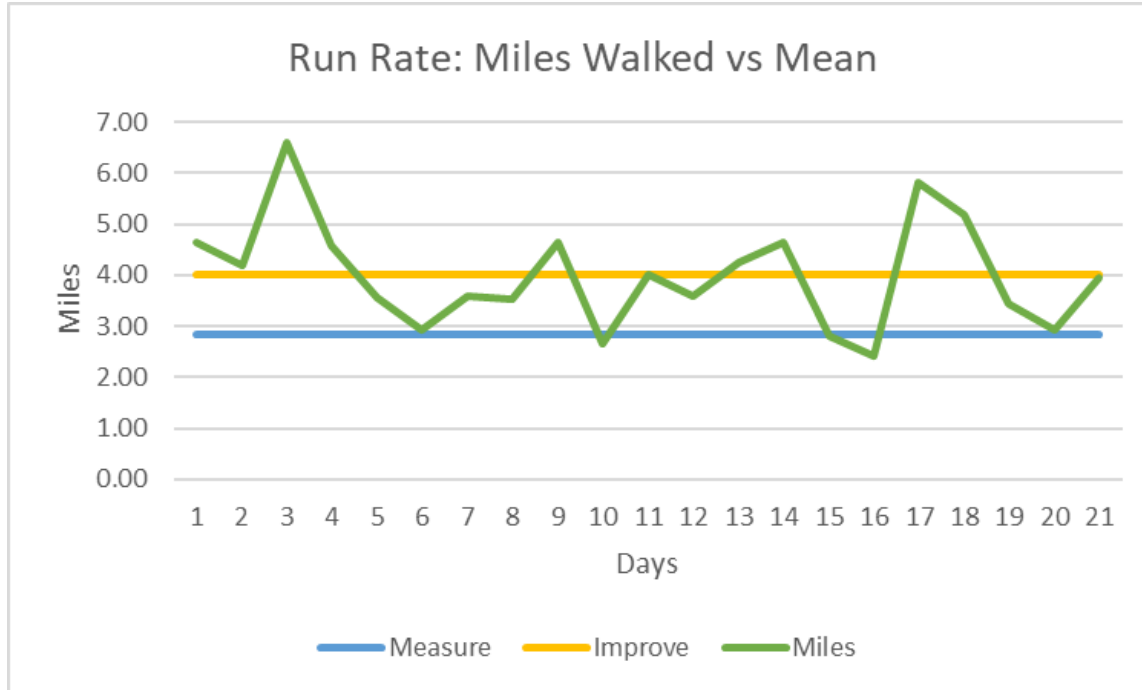
- **Reduced Time**
  - Retain the reductions in time spent being non-active. These times, especially on lunch and while being social, can be reduced even further and be used as a time to walk.

- **Increased Active Minutes**
  - Since reducing non-active time I have been able to increase my active minutes. To keep my improvement in place I will have to continue to spend time actively walking. If I were to increase my daily mile goal, increasing the active minutes I average per day is obtainable.

- **Four Mile Daily Target**
  - Simply put, I will have to continue to target four miles a day to maintain the gains I received from the improvement. Spending time walking where I would have been non-active on my lunch break or being social will have to be used to walk to continue to pursue my goal.

Conclusion

- I started this process improvement project with a goal of walking on average an additional mile a day. By walking more and leading a healthier lifestyle I can potentially avoid approximately $19,000 in medical bills and even earn gift cards from my medical provider. I created a process map of my daily life that helped me to identify spots in my day where I could potentially increase the distance I walk. Observing the original sample; I walked on average 2.85 miles and hardly ever walked above my goal distance of 3.85 miles. There was many possible defect opportunities in my process which lead to a very low sigma quality level of 1.5. Analyzing my processes, I came to the solution that I would have to reduce time spent being non-active during lunch or while being social and spend more of this time being active to hit my target. After reducing non-active time and increasing active time, I was able to average a distance walked of four miles a day. The improvement also lead to an increased sigma quality level of 2.3. To control the progress I have made I will have to maintain the time reduction to non-active time; as well as, the increase to active minutes. I will continue to target a daily average of four miles walked per day.