

THE BARN'S PATTIES

Group 14

Members: Dhruv Simha, Jenny Nguyen, Ryan Shahidi, Kushal Thirupati

INTRODUCTION:

Our project is focused on uncovering the complexities of the food prep and serving process at “The Barn.” Our investigation is prompted by the inconsistency of the sizes of chicken, beef and soy chicken patty, as well as the inconsistency of the food quality, which has been a major concern among customers. The foundation of our investigation lies in the daily work of the kitchen team, who are responsible for procuring, storing, and cooking the chicken patty. Our mission is motivated by the desire to increase customer satisfaction by directly addressing the issues associated with the fluctuating sizes and the inconsistent quality of the food served. By analyzing and improving the patty prep pipeline, we aim to create a better dining experience within “The Barn”. The methodology includes gathering empirical data about the size of the chicken patty dispensed, collecting customer reviews, and analyzing the kitchen dynamics to identify commonalities and areas for improvement.

The focus of our research is on the details of the chicken, beef, and soy chicken patty during preparation. This concentration comes from understanding the critical role these elements play in the variability of the patties’ weight and the food’s perceived quality. Our data amassment methodology is characterized by spending a full day, from 11 am to 8 pm, tracking the weight fluctuations of each meat type at hourly intervals. This systematic approach is intended to fuel our follow up analysis through X-bar statistical control chart, a pareto chart, and ANOVA testing, for each patty type. The control charts are to determine if the weight variance among the patties, during an hourly basis, is within a reasonable range or if it is out of the control. This insight will help us determine if the size differences are within acceptable tolerances. The pareto chart is meant to help us identify common inconsistencies and complaints about the various patties

served at “The Barn.” The ANOVA test also looks at whether there is an overall consistency across the meat types, but this time comparing it on a daily basis, rather than hourly.

There are many benefits to starting this analytical process to analyze the processes and components we’ve identified. First, it sets the stage for identifying the source of variability and quality issues, both on an hourly and daily basis, so that targeted corrective actions can be taken. By addressing these key issues, “The Barn” will be able to significantly improve its operational effectiveness, reduce waste, and most importantly, increase the dining experience of its customers. Not only will this solve the immediate issues, but it will also help to create a culture of continuous improvement and excellence in “The Barn.” As UCR students, The Barn is a place that all of us have eaten at least once, and we all either have personal complaints, or heard about complaints from others. We wish to analyze their processes in order to see if these complaints have any backing.

METHODOLOGY:

Our group began a thorough and systematic research project to address the challenges of food prep and serving at “The Barn,” especially the issues of inconsistent patty size and food quality. The core of our approach is to understand and address the root causes of these discrepancies, with the goal of improving the dining experience for our customers.

In order to begin our research, we first identified the specific steps required for a comprehensive analysis of food preparation and serving. This necessitates a multi-layered data collection strategy. We plan to spend three days, from 11 am - 8 pm, carefully documenting the weight changes of chicken, Beef, and Soy Chicken patties hourly. This level of granular data

collection is essential to capture variability across different time points in the day, thus providing a robust dataset for further analysis.

A key component of our approach is a well-thought-out strategy for communicating our findings with stakeholders. This is essential to ensure that the results of our research are translated into actionable solutions. Through presentations and in-depth reports, we engage with the kitchen team, management and potentially customers to create an environment of collaboration where feedback is respected and used to improve.

Once the empirical data is collected, our analytical phase includes several types of statistical analysis to identify the trends and underlying causes of the observed discrepancies. Using X-bar control charts, we can analyze the weight variance between the patties on an hourly basis, and see whether it is within a reasonable range, or if it is deviating significantly, suggesting a lack of control of the process. In addition, we will use ANOVA testing to determine whether there is any underlying consistency or difference across the meat types on a day to day basis. We'll use Pareto charts to identify the most common issues and highlight the areas that require the most focus. We'll be collecting feedback directly from customers in and around the busy Bell Tower with a goal of 45 responses. The feedback will be broken down into four main categories: "too small", "too greasy," "cooked poorly" or "too large." Targeted feedback is an essential part of our analysis because it allows us to focus on the most important issues as perceived by customers.

The last step in our process is the creation and implementation of an action plan to resolve the identified challenges. Working closely with "The Barn's" team, we will prioritize the

suggested changes based on practicability, impact, and availability of resources, ensuring that the actions taken are impactful and sustainable.

Our project's methodology, which is based on in depth feedback and in depth data analysis, has several key benefits. By gathering first-hand feedback directly from our customers about the discrepancies in patty size and quality, we're setting ourselves up to make informed improvements that truly align with their dining experiences. It's not just about identifying what's wrong; it's about understanding the details, such as if the patties were too small, overly greasy, undercooked, or oversized. Based on the feedback of 45 patrons in the Bell Tower, this in depth analysis allows us to focus our efforts where they'll make the biggest impact. It also creates a deeper connection with the people we're trying to please, ensuring that any adjustments we make align directly with their expectations. Ultimately, it's a continuous cycle of feedback and improvement that sets us up for long term, sustainable excellence in "The Barn". Additionally, since we are using control charts and an ANOVA test, we are able to not only analyze the potential variation on an hourly basis within the same day, but also potential variation day to day.

THE DATA:

Chicken Patty	Day 1	Day 2	Day 3	Beef Patty	Day 1	Day 2	Day 3
11:00 AM	110	92	91	11:00 AM	114	130	125
12:00 PM	103	106	100	12:00 PM	142	135	131
1:00 PM	95	94	95	1:00 PM	120	142	119
2:00 PM	101	100	108	2:00 PM	135	115	133
3:00 PM	93	108	93	3:00 PM	127	124	127
4:00 PM	108	97	106	4:00 PM	126	140	120
5:00 PM	97	90	97	5:00 PM	139	128	129
6:00 PM	105	103	104	6:00 PM	148	117	111
7:00 PM	99	110	98	7:00 PM	113	120	139
8:00 PM	104	105	92	8:00 PM	128	131	137

Soy Chicken	Day 1	Day 2	Day 3
11:00 AM	90	89	91
12:00 PM	87	92	90
1:00 PM	88	92	94
2:00 PM	94	92	93
3:00 PM	89	88	93
4:00 PM	88	92	89
5:00 PM	90	94	88
6:00 PM	91	90	92
7:00 PM	95	88	93
8:00 PM	86	89	90

Data for Pareto Charts:

Number	Complaint	Freq	Percentage
1	Too big	4	8.9
2	Too Greasy	11	24.4
3	Too Small	21	46.7
4	Cooked Poorly	9	20
		45	100%

Our group conducted on-site data collection at "The Barn" establishment. We physically went to the kitchen area where food preparation takes place and observed the process of patty preparation. Specifically, we focused on chicken, beef, and soy chicken patties. At each hour from 11 am to 8 pm, we sampled patties of each type and recorded their weights. (11am, 12pm,

1pm, 2pm, 3pm, 4pm, 5pm, 6pm,, 7pm, 8pm) While collecting the data, the primary challenge was setting up the process of collecting and the large amount of time it took to collect the data. Moreover, having the sample group (the team at the Barn) to come onboard to allow us to conduct the data collection, took some convincing. Overall, the primary data collection experience was time consuming.

The data is of good quality. Our team and I ensured we meticulously collected the data. The data collected comprises the weights of chicken, beef, and soy chicken patties sampled hourly over the course of three days. Each day, data collection started at 10 am and continued until 8 pm, resulting in a total of 10 sampling points per patty type per day. Therefore, for each type of patty (chicken, beef, soy chicken), we have 30 observations across the three days.

Several important rules and guidelines were followed to ensure accuracy and consistency in the sampling process:

1. Adherence to Food Safety Protocols: All members of the group followed strict food safety protocols, including wearing appropriate attire such as hairnets and gloves, to prevent contamination of the food samples.

2. Standardized Sampling Procedure: A standardized procedure was established for sampling patties to ensure consistency across all observations. This procedure likely involved using a specific tool or method for obtaining each patty sample.

3. Randomized Sampling: To minimize bias in the data collection process, patties were sampled randomly from batches prepared during each hourly interval. This randomization helped ensure that each patty had an equal chance of being selected for measurement.

4. Consistent Timing: Data collection occurred at consistent intervals, with patties being sampled every hour from 11 am to 8 pm. This consistent timing helped control for variations that might arise due to factors like peak hours or shifts in kitchen activity.

5. Avoiding Interference with Operations: The group made sure not to interfere with the regular operations of the kitchen while collecting data. This likely involved coordinating with kitchen staff to find suitable times and locations for sampling that wouldn't disrupt the workflow.

6. Accurate Measurement: Careful attention was paid to accurately measuring the weight of each patty sampled. Precision in measurement ensured that the data collected would be reliable for subsequent analysis.

7. Recording Observations: Detailed records were kept of each observation, including the time of sampling and the weight of each patty. This documentation allowed for thorough analysis of the data and facilitated comparison across different time points and patty types.

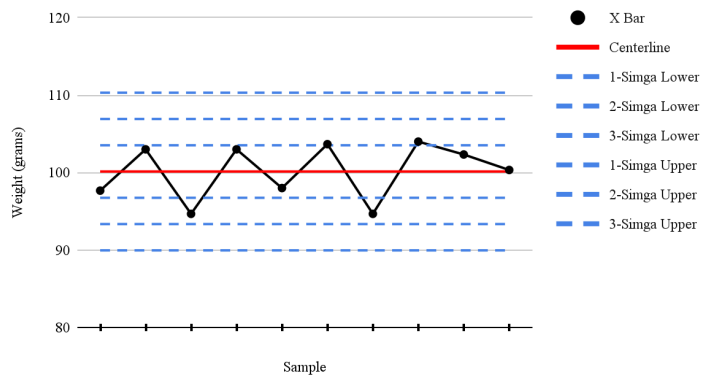
On top of this, we also conducted surveys (form: <https://bit.ly/TheBarnPattySurvey>) of 45 barn customers and asked them four questions:

1. Were the Patties too big?
2. Were the Patties too greasy?
3. Were the Patties too small?
4. Were the Patties cooked poorly?

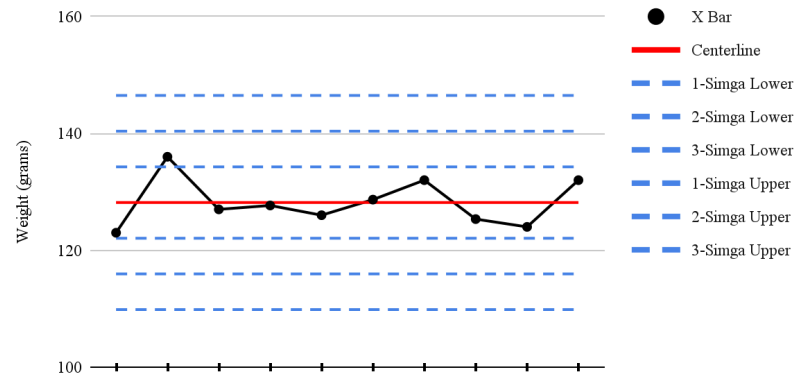
Based on the information we collected, we grouped the questions into 4 categories, and analyzed the results using Pareto charts. Collecting data from customers was significantly easier as compared to collecting data from the Supply Side (The Barn).

ANALYSIS:

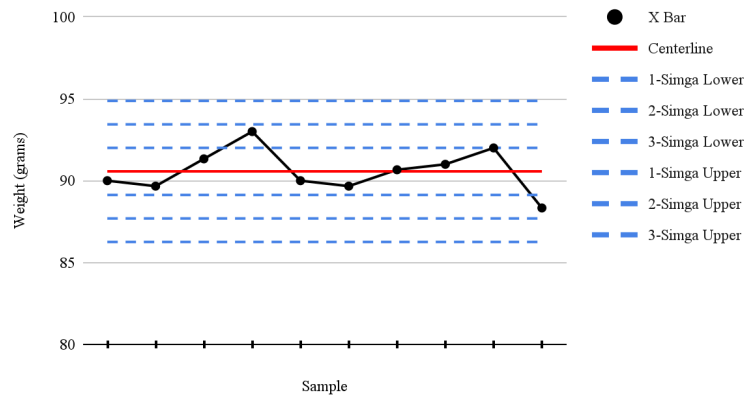
X-Bar Chart for Chicken Patties



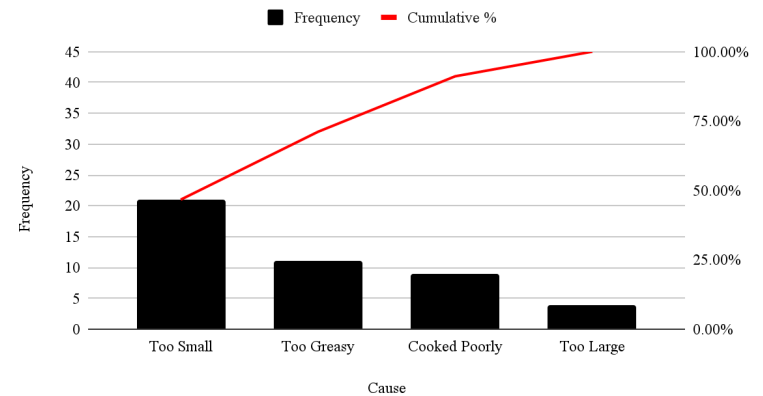
X-Bar Chart for Beef Patties



X-Bar Chart for Soy Chicken Patties



Pareto Chart for The Barn Patties



Control Chart for chicken patties: This process appears to be in control and does not violate any of the Western Electric Handbook Rules. However, the chicken patties display the most variation hour-to-hour when compared to the other two charts.

Control Chart for beef patties: This process appears to be in control and does not violate any of the Western Electric Handbook Rules.

Control Chart for soy chicken patties: This process appears to be in control and does not violate any of the Western Electric Handbook Rules.

Pareto Chart for The Barn Patties: According to the Pareto Chart, The Barn should focus their efforts on increasing patty sizes, but should remain wary of making them “too large.”

ANOVA CALCULATION

Chicken patty

- **Overall Mean (Grand Mean):** The overall mean of all chicken patty weights is 100.13g.
- **Between-group Sum of Squares (SS_{between}):** This measures the variation between the different days. It is calculated as the sum of the squared differences between each day's mean and the overall mean, each multiplied by the number of observations for that day. For the chicken patties, SS_{between} is 50.07.
- **Degrees of Freedom Between (DF_{between}):** This is calculated as the number of groups (days) minus one. Since there are three days, $DF_{\text{between}} = 3 - 1 = 2$.
- **Mean Square Between (MS_{between}):** This is the SS_{between} divided by DF_{between}. For our chicken patties data, $MS_{\text{between}} = 50.07 / 2 = 25.03$.
- **Within-group Sum of Squares (SS_{within}):** This measures the variation within each of the days. It is calculated by summing the squared differences between each observation and its day's mean. For the chicken patties, SS_{within} is 1039.4.
- **Degrees of Freedom Within (DF_{within}):** This is calculated as the total number of observations minus the number of groups (days). Here, there are 30 observations across 3 days, so $DF_{\text{within}} = 30 - 3 = 27$.
- **Mean Square Within (MS_{within}):** This is SS_{within} divided by DF_{within}. For our chicken patties data, $MS_{\text{within}} = 1039.4 / 27 = 38.50$.
- **F-Statistic:** This is the ratio of MS_{between} to MS_{within}. For the chicken patties, the F-statistic is $25.03 / 38.50 = 0.65$.
- **P-value:** 0.53

Null Hypothesis: There is no significant difference between the average weight of chicken patties each day.

Alternate Hypothesis: At least one of the days yields a significantly different patty weight on average.

Test Statistic: $p = 0.53$

Rejection Region: $p < \alpha = 0.05$

Conclusion: Since our p-value of 0.53 is greater than our significance value of $\alpha = 0.05$, we fail to reject the null hypothesis and cannot conclude that at least one of the days yields a significantly different weight on average for chicken patties. However, these patties do display more variation on a day-to-day basis than the other two patties.

Beef Patty

- **Overall Mean (Grand Mean):** The overall mean of all beef patty weights is 128.17g.
- **Between-group Sum of Squares (SS_between):** For the beef patties, SS_between is 22.07.
- **Degrees of Freedom Between (DF_between):** Since there are three days, $DF_between = 3 - 1 = 2$.
- **Mean Square Between (MS_between):** For our beef patties data, $MS_between = 22.07 / 2 = 11.03$.
- **Within-group Sum of Squares (SS_within):** For the beef patties, SS_within is 2686.1.
- **Degrees of Freedom Within (DF_within):** Here, there are 30 observations across 3 days, so $DF_within = 30 - 3 = 27$.
- **Mean Square Within (MS_within):** For our beef patties data, $MS_within = 2686.1 / 27 = 99.49$.
- **F-Statistic:** For the beef patties, the F-statistic is $11.03 / 99.49 = 0.111$.
- **P- value:** 0.895

Null Hypothesis: There is no significant difference between the average weight of beef patties each day.

Alternate Hypothesis: At least one of the days yields a significantly different patty weight on average.

Test Statistic: $p = 0.895$

Rejection Region: $p < \alpha = 0.05$

Conclusion: Since our p-value of 0.895 is greater than our significance value of $\alpha = 0.05$, we fail to reject the null hypothesis and cannot conclude that at least one of the days yields a significantly different weight on average for beef patties.

Soy Chicken

- **Overall Mean (Grand Mean):** The overall mean of all soy chicken weights is 92.6g.
- **Between-group Sum of Squares (SS_between):** For the soy chicken, SS_between is 1.4.
- **Degrees of Freedom Between (DF_between):** Since there are three days, $DF_between = 3 - 1 = 2$.

- **Mean Square Between (MS_between):** For our soy chicken data, $MS_between = 1.4 / 2 = 0.7$.
- **Within-group Sum of Squares (SS_within):** For the soy chicken, SS_within is 2185.8.
- **Degrees of Freedom Within (DF_within):** Here, there are 30 observations across 3 days, so $DF_within = 30 - 3 = 27$.
- **Mean Square Within (MS_within):** For our soy chicken data, $MS_within = 2185.8 / 27 = 80.96$.
- **F-Statistic:** For the soy chicken, the F-statistic is $0.7 / 80.96 = 0.00865$.
- **P-value:** 0.991

Null Hypothesis: There is no significant difference between the average weight of soy chicken patties each day.

Alternate Hypothesis: At least one of the days yields a significantly different patty weight on average.

Test Statistic: $p = 0.991$

Rejection Region: $p < \alpha = 0.05$

Conclusion: Since our p-value of 0.991 is greater than our significance value of $\alpha = 0.05$, we fail to reject the null hypothesis and cannot conclude that at least one of the days yields a significantly different weight on average for soy chicken patties.

CONCLUSION:

In examining the food preparation and quality at "The Barn", the primary focus has been on understanding the variability and consistency in patty sizes for beef, chicken, and soy chicken offerings. Our comprehensive analysis, utilizing X-bar control charts, ANOVA testing, and Pareto charts, sought to unveil patterns and potential inconsistencies in the preparation process that could impact food quality and customer satisfaction.

The stakeholders identified in this analysis include the kitchen staff and chefs, the management team, and the customers of "The Barn." The kitchen staff and chefs are crucial as understanding the findings of our data can directly impact their practices in ensuring consistency of the food prepared, the management team's role is to oversee operations and implement

necessary changes to address any identified issues, aiming to enhance customer satisfaction. Meanwhile, the customers, who are the end recipients of the products, are directly impacted by the quality and consistency of the food served. Their feedback is essential for the continuous improvement of "The Barn's" offerings.

The impact of our findings indicates that while the overall processes seem to be under control, there is a noticeable variability in our data, particularly with chicken patties, which suggests inconsistency in preparation. This inconsistency, highlighted by customer feedback, particularly focuses on the size of the patties. Such variability can lead to customer dissatisfaction and adversely affect the reputation of "The Barn" amongst students on campus.

To address these issues, we recommend the implementation of more standardized procedures for patty preparation to minimize variability. Additionally, although “The Barn” teaches a procedure to achieve consistency, many of the workers do not implement that procedure. Therefore, increasing training for kitchen staff could help in maintaining uniform food preparation methods, ultimately leading to a more consistent product. Another recommendation is to reassess the patty suppliers to ensure their products meet the desired standards of consistency and quality.

Our study is not without its flaws. The data collection period was limited to three days, which may not be sufficient to capture all variables affecting patty weights and quality. Different shifts could have different variability in the patty size, and identifying which shifts have higher variability out of a longer period of time, e.g. two weeks, could aid in eliminating the problem. Moreover, the method employed for collecting customer feedback might not have been entirely random, potentially leading to biased results. Many who answered were friends and classmates

who were either disinterested or only answered out of dissatisfaction, which skewed our results as there also wasn't much variability in the complaints.

By addressing these findings in our data, "The Barn" can significantly improve the consistency of its food preparation processes, leading to higher customer satisfaction and a stronger reputation amongst students at the school.

References:

Find The-Barn-UCR Calories & Nutrition Facts | Myfitnesspal,

www.myfitnesspal.com/nutrition-facts-calories/the-barn-ucr. Accessed 17 Mar. 2024.

"Nutritional Information for Market at Glen Mor." Dining Services, University of California, Riverside, [16 March. 2024),

<https://foodpro.ucr.edu/foodpro/label.asp?locationNum=05&locationName=Market+at+Glen+Mor&dtdate=10%2F3%2F2021&RecNumAndPort=358040%2A6>

Mega, JT. "Patty Forming: Points of Differentiation." *Burger Cravings*, 12 Mar. 2021,

burgercravings.com/burger-blog/patty-forming-points-of-differentiation/.

"Scotty's Spicy Chicken Sandwich." UCR Dining Services, University of California, Riverside,

[16 March 2024]. auxiliarydocs.ucr.edu/dining/Scotty's_Spicy_Chicken_Sandwich.pdf.

Universal, NBC, and Aly Walansky. *How to Cook Burgers: 10 Common Mistakes to Avoid*

Making, TODAY, 29 Apr. 2021, www.today.com/today/amp/tdna182475.