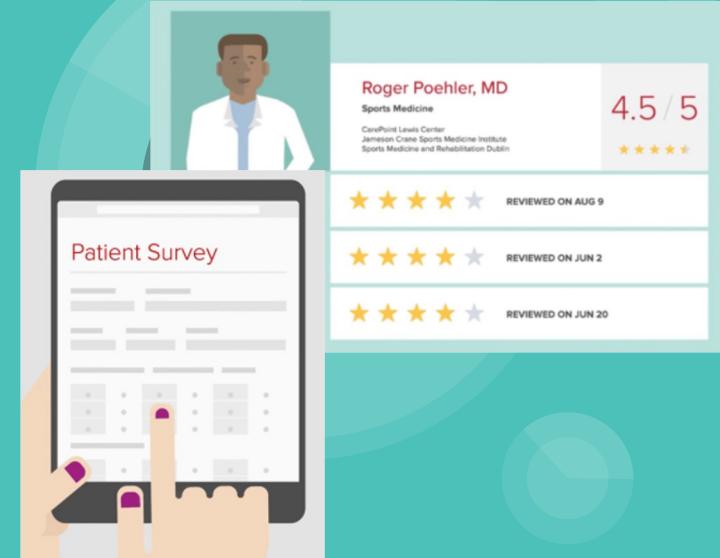


Clinician Satisfaction at GroupHealth

Statistical Analysis

Nikita Daharia





INTRODUCTION

Patient satisfaction surveys have become one of the most valuable tools in gauging physician-patient relationships and the patient's overall satisfaction with the clinician.

Specifically, Group Health's patient satisfaction surveys focused on the **patient's satisfaction with the clinician (clinician satisfaction) to be used as a measuring tool** to translate improvement categories and ratings of the clinician into meaningful, quantifiable, and actionable data.

The **purpose of the study** is to utilize statistical analysis to **recognize trends among the Group Health patient satisfaction survey data as a method to supply recommendations** in order to improve clinician performance and ensure excellence in Group Health's individualized physician-patient care experience.

Data Summary

Proposed Hypothesis:

1. H_1 : There is a statistically significant difference between clinician rating in the Central and Southern regions.
 H_0 : There is no statistically significant difference between clinician rating in the Central and Southern regions.
1. H_1 : There is a positive correlation between correct diagnosis and treatment utilization and clinician rating.
 H_0 : There is no correlation between correct diagnosis and treatment utilization and clinician rating.
1. H_1 : There is a negative correlation between client satisfaction and the panel size of different districts.
 H_0 : There is no correlation between client satisfaction and the panel size of different districts.
1. H_1 : There is a statistically significant difference between clinician rating and wait time explanation.
 H_0 : There is no statistically significant difference between clinician rating and wait time explanation.

Variables-

Dependent Variable:

- Clinician Rating

Independent Continuous Variables:

- % Female
- Average Age
- Total Panel Size
- % panel vst seen by PCP
- Panel - % Medicare
- PCP consult ratio
- Listen carefully to you?
- Explain understandably?
- Spend enough time w/ you?
- Respect what you said?
- Your best interests 1st?
- Info to diagnose/treat
- Knowledge of medical hx
- Helpful-clinical staff
- Courtesy/Respect-clinical
- Helpful-office staff
- Courtesy/Respect-office
- In exam room w/in 15 min
- Wait time explanation

Independent Categorical Variables:

- Clinic
- Division
- District
- Specialty
- Region

Data Summary



Explanation of Variables-

In this analysis, the dependent variable is the clinician rating (1-10). Clinician rating explains how the patient felt about the quality of care they received from their provider. The rating is based on several different independent variables. In this paper, the main focus was on the following variables; sample size (size of district), , ability of clinician to explain better, and wait times. It is further interesting to see how certain variables had a bigger impact on ratings across different districts.

Sample size criteria-

The following guidelines were used to derive the final working data.

1. Physician panels that have 125+ patients
2. Physician panels that practice internal medicine and family medicine
3. Physician panels that have all categorical data present for clinic, division, district, specialty, and region data
4. Physician panels that have all data from the Patient Experience Survey provided by Group Health Cooperative

The guidelines are used to create the final working data. This resulted in a sample size of 196 physician panels. The panels are sorted by district below:

Health Care Center District (HCCD) - 30 Providers

Kitsap (KIT) - 19 Providers
King (KNG) - 36 Providers
Olympia (OLY) - 23 Providers
Seattle (SEA) - 54 Providers
Snohomish (SNOH) - 9 Providers
Tacoma (TAC) - 25 Providers

Total Sample Size

Figure 1:

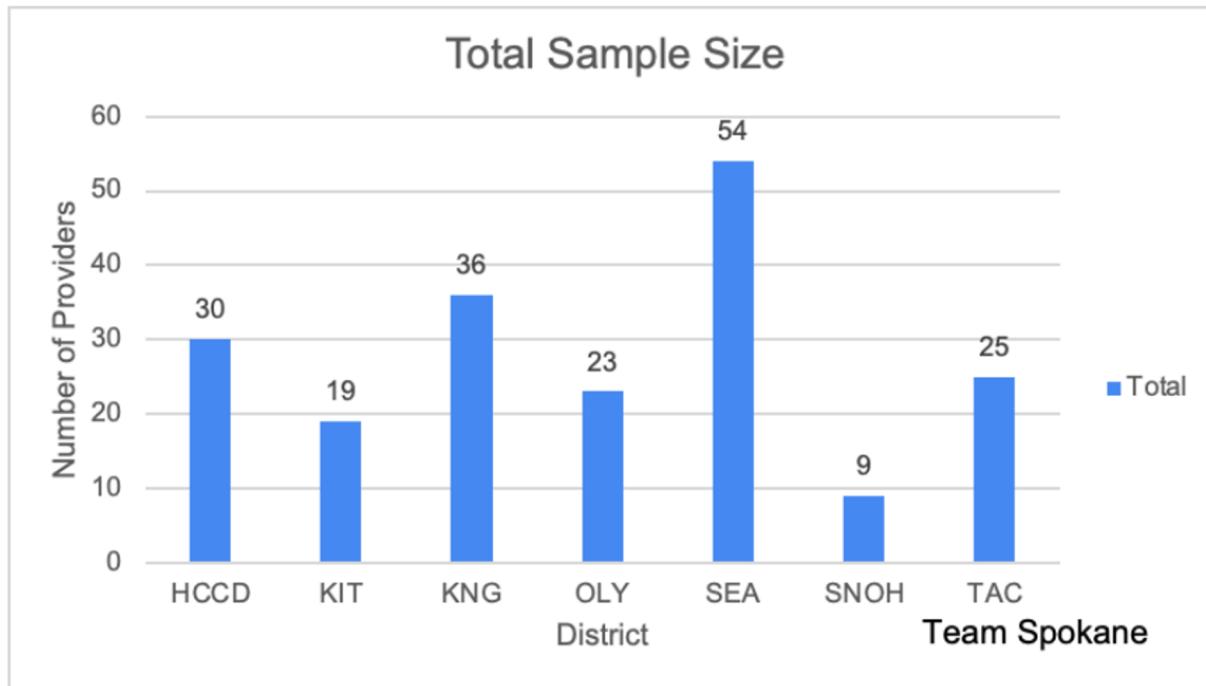


Figure 1. Total number of providers from each district that met sample size criteria. (Excel: Total Sample Size Histogram tab)



Descriptive Statistics

Table 1:

| <i>Clinician rating (0-10)</i> | |
|--------------------------------|----------|
| Mean | 0.7833 |
| Standard Error | 0.0070 |
| Median | 0.8022 |
| Mode | 0.8750 |
| Standard Deviation | 0.0984 |
| Sample Variance | 0.0097 |
| Kurtosis | 0.6162 |
| Skewness | -0.8972 |
| Range | 0.4879 |
| Minimum | 0.4483 |
| Maximum | 0.9362 |
| Sum | 153.5171 |
| Count | 196.0000 |
| Confidence Level(95.0%) | 0.0139 |

Table 1: gives the descriptive statistics for all districts combined Clinician rating (0-10).

Table 1. Descriptive statistics of Clinician rating (0-10) for all districts combined (Excel: Descriptive Statistics tab)

Descriptive Statistics

Table 2:

| <i>Clinician rating (0-10)</i> | HCCD | KIT | KNG | OLY | SEA | SNOH | TAC |
|--------------------------------|---------|---------|---------|---------|---------|---------|---------|
| Mean | 0.8024 | 0.7833 | 0.7994 | 0.7450 | 0.8005 | 0.7707 | 0.7395 |
| Standard Error | 0.0143 | 0.0245 | 0.0153 | 0.0241 | 0.0122 | 0.0362 | 0.0216 |
| Median | 0.8117 | 0.8246 | 0.8250 | 0.7547 | 0.8235 | 0.7586 | 0.7586 |
| Mode | 0.8750 | 0.8750 | 0.8571 | #N/A | 0.7500 | #N/A | #N/A |
| Standard Deviation | 0.0783 | 0.1068 | 0.0919 | 0.1157 | 0.0894 | 0.1085 | 0.1079 |
| Sample Variance | 0.0061 | 0.0114 | 0.0084 | 0.0134 | 0.0080 | 0.0118 | 0.0116 |
| Kurtosis | 3.5838 | 1.8107 | -0.7674 | 0.5698 | -0.0386 | -1.3022 | 0.3789 |
| Skewness | -1.4375 | -1.3438 | -0.6184 | -0.7278 | -0.6679 | 0.0550 | -0.9872 |
| Range | 0.3744 | 0.4040 | 0.3206 | 0.4777 | 0.3956 | 0.3204 | 0.4115 |
| Minimum | 0.5313 | 0.4889 | 0.6000 | 0.4483 | 0.5405 | 0.6111 | 0.4615 |
| Maximum | 0.9057 | 0.8929 | 0.9206 | 0.9259 | 0.9362 | 0.9315 | 0.8730 |
| Sum | 24.0714 | 14.8827 | 28.7772 | 17.1340 | 43.2277 | 6.9363 | 18.4879 |
| Count | 30.0000 | 19.0000 | 36.0000 | 23.0000 | 54.0000 | 9.0000 | 25.0000 |
| Confidence Level(95.0%) | 0.0292 | 0.0515 | 0.0311 | 0.0500 | 0.0244 | 0.0834 | 0.0445 |
| Upper limit | 0.8316 | 0.8348 | 0.8305 | 0.7950 | 0.8249 | 0.8541 | 0.7840 |
| Lower Limit | 0.7731 | 0.7318 | 0.7683 | 0.6949 | 0.7761 | 0.6873 | 0.6950 |

Table 2: gives the descriptive statistics for Clinician rating (0-10) for each individual district.

Table 2. Descriptive statistics of Clinician rating (0-10) for each district (Excel: Descriptive Statistics tab)

Descriptive Statistics Analysis



- While the differences between each mean are minor, there is clear variability across the district. It is easy to see that some district's physicians are outperforming others.
- The districts do not vary much with standard deviation with all being .018-.2 away from the standard deviation.
- The kurtosis of all districts except HCCD are platykurtic suggesting that the data is far more distributed towards the tail with a score of >3. Compared to a normal bell curve score of 3 which would mean it is normally distributed. HCCD value of 3.583 suggests that its data is distributed far more towards the mean and narrower. It has less variation from the mean and is leptokurtic shaped.
- Health Care Center District (HCCD) averages the highest clinician rating from patients and is .019 higher than the mean of all districts. The lowest clinician rating from patients belongs to Tacoma (Tac) with a mean .043 lower than the mean of all districts. This suggests that patients from HCCD think far more highly of their clinicians than TAC by a difference of .062.
- All districts except Snohomish have negative skewness suggesting all their data is skewed to the left. More statistical analysis is needed to further understand the variation amongst Clinician ratings.

Graphs - Confidence Interval

Confidence Intervals:

Figure 2:

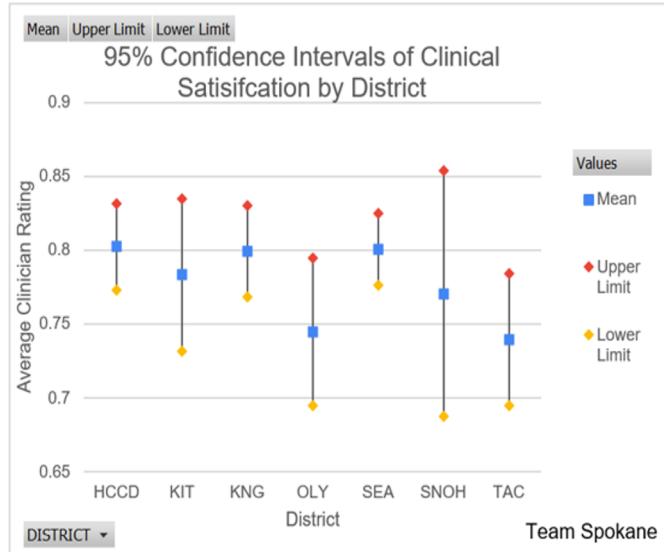


Figure 2. The average Clinical Satisfaction rating sorted by district. The blue square represents the mean for each district, the two diamonds represent the upper limit (red) and lower limit (yellow) (Excel: Descriptive Stats and Confidence Tab).

Figure 2. Presents the confidence intervals of the average Clinical Satisfaction rating sorted by district.

The upper and lower limits were found using Excel's descriptive statistics function and adding the 95% confidence value to the mean to find the upper limit and subtracting the 95% confidence value to the mean to find the lower limit for each district.

There is little variation between each data point, to compensate the y-axis was adjusted to start at .65 and list in .05 increments to better show the intervals. 95% of all data points will lie between the upper and lower limits.

The graph indicates that there is no statistically significant difference between the districts as all confidence intervals overlap meaning that there is not enough variance in the means.

Graph - Histogram

Proposed Hypothesis graphs -

Figure 3

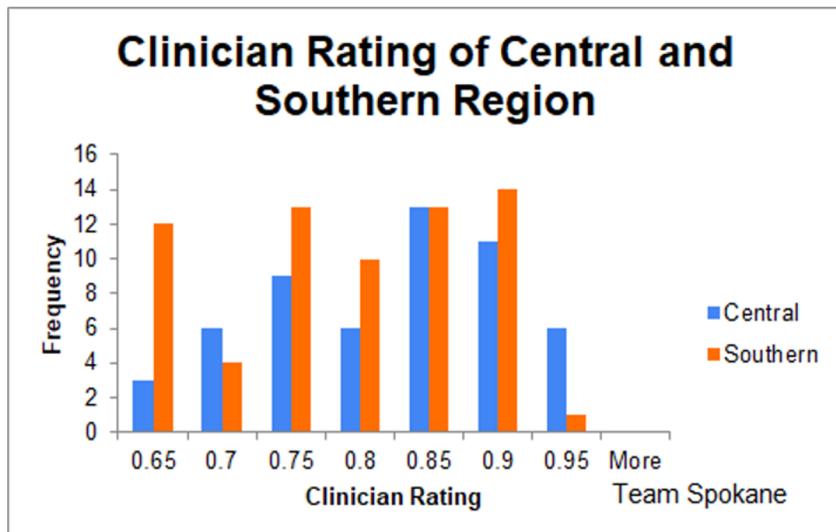


Figure 3: Histogram representing clinician rating and frequency between the Central and Southern Region. (Excel: Histogram Clinical Rating tab)

Figure 3. To see if there was a statistically significant difference between the two regions a t-test with equal variances was performed on excel(...).

Equal variances were used because the difference between the two variances was less than 4. With a $p(T \leq t) = .007$ the null hypothesis is rejected as it is less than .05.

This suggests that there is enough evidence to reject the null hypothesis that there is no statistically significant difference between Central and Southern regions. More research would be needed to find if it is in fact statistically significant.

Graphs - 2 axes

Figure 4:

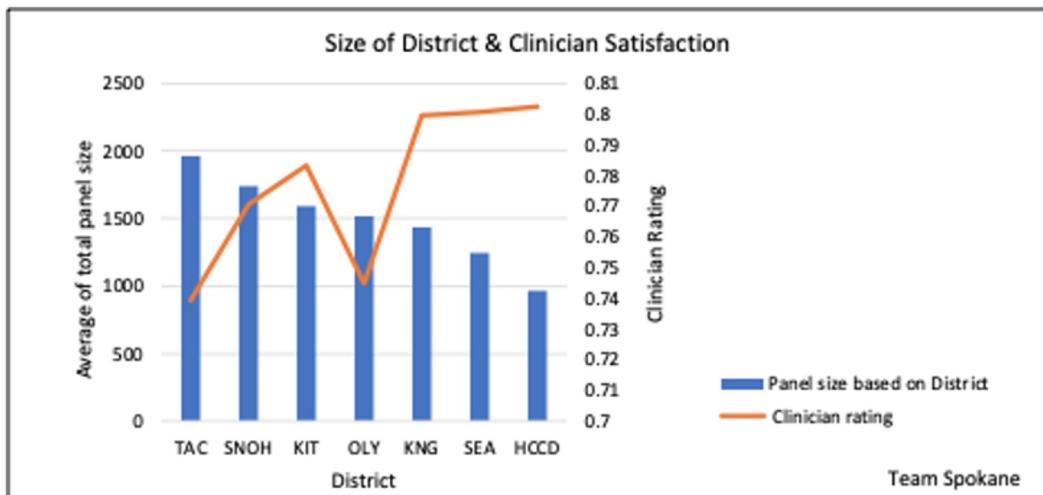


Figure 4: shows the average Clinician rating (0-10) and the average of total panel size across each district (Excel: District vs. clinician satisfaction).

Figure 4. There is a negative correlation between the rating of the clinician and the panel size under them across each district except for Olympia which does not follow the trend.

The district Tacoma has the largest panel size and lowest rating while the district Health Care Center District has the smallest panel size and highest rating of their patients.

This trend is also true for the other districts including Snohomish, Kitsap, King County and Seattle.

Graph - Bar Graph

Figure 5:

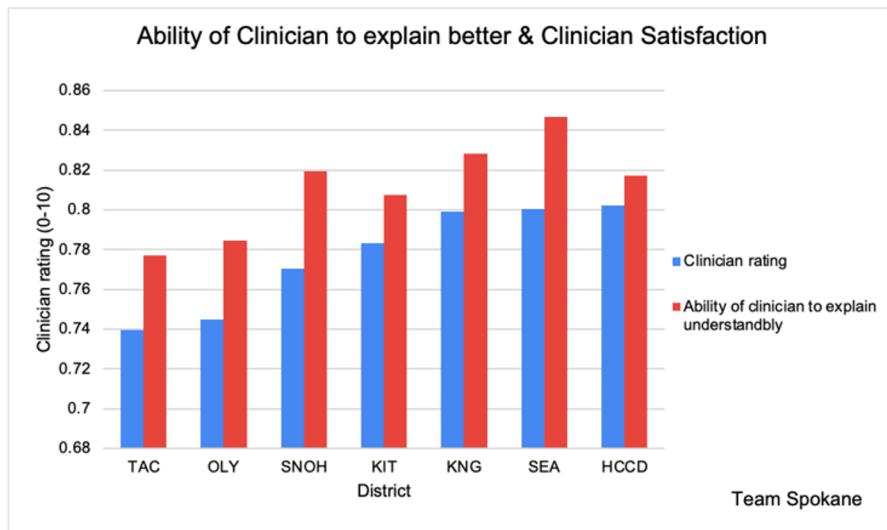


Figure 5: Shows the average Clinician rating (0-10) and the ability of clinicians to explain understandably to the patients across each district (Excel: Explain better vs rating tab).

Figure 5. There is a positive correlation between the rating of the clinician and the ability of clinicians to explain understandably to the patients.

The districts Seattle, Health Care Center District, King, Snohomish, Health Care Center District have the highest rated clinicians by their patients which directly correlates with the higher rating of ability of the clinician to explain better.

Graph - Scatterplot

Figure 6:

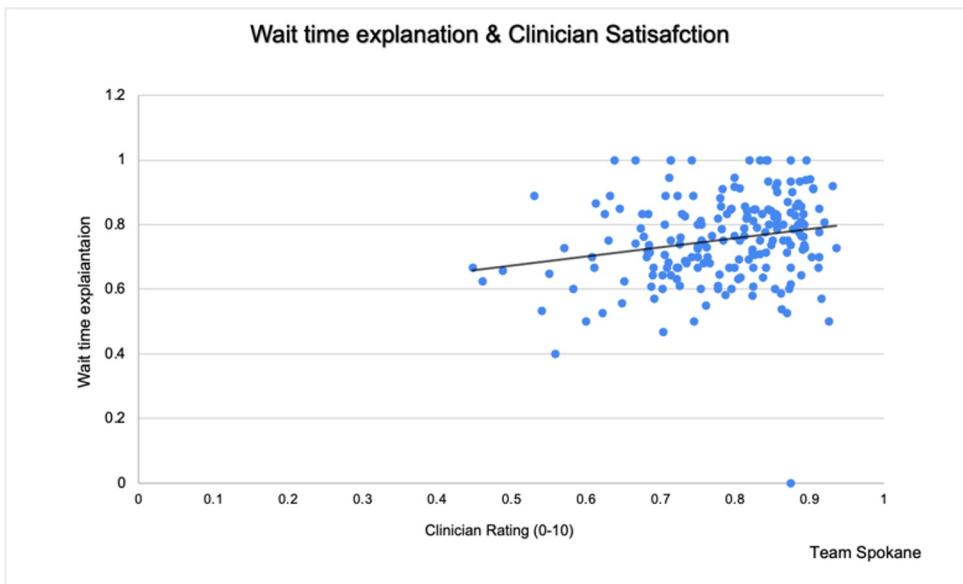


Figure 6: displays a scatter plot comparison between the average Clinician rating (0-10) by the patients and the wait time explanation provided by them. (Excel: Wait time vs rating).

Figure 6. There is a possibility of correlation between the two variables. To determine a statistically significant difference between the two regions a t-test with equal variances was performed on Excel(...).

Equal variances were used because the difference between the two variances was less than 4. With a $p(T \leq t)$ of .006 the null hypothesis is rejected as it is less than .05.

This suggests that there is enough evidence to reject the null hypothesis that there is no statistically significant difference between the average Clinician rating (0-10) and the wait time explanation provided by them. More research would be needed to find if it is in fact statistically significant.

Final Discussion



- Wait time explanation did not prove to alter clinician rating. **The null hypothesis was rejected and there was no statistically significant difference between the average clinician rating and the wait time explanation.**
- The null hypothesis on the relationship between Central and Southern regions was rejected as there is **no statistically significant difference among the Central and Southern regions.**
- The highest average patient clinician rating by district was in Health Care Center District while the lowest was in Tacoma. There is **no statistically significant difference between clinician satisfaction and district.**
- The district of Tacoma to house the largest panel size and the lowest clinician rating, while on the other hand, the HCCD housed the smallest panel size and the highest clinician rating.
- There is a **negative correlation** between clinician rating and panel size as a smaller panel size is favorable for scoring higher clinician ratings.
- There is a **positive correlation** among the rating of the clinician and the ability of clinicians to explain understandably to their patients.

Rationale for Panel Size



Sample size per test

z-test: 2 regions

f-test: 2 districts

t-test: 2 districts

ANOVA + Tukey test: 4 clinics

Mann-Whitney: 2 clinics

Kruskal Wallace: 3 clinics

Sample size criteria (from paper 1):

The following guidelines were used to derive the final working data.

1. Physician panels that have 125+ patients
2. Physician panels that practice internal medicine and family medicine
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The guidelines are used to create the final working data. This resulted in a sample size of 196 physician panels. The panels are sorted by district below:

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STATISTIC CALCULATIONS:

- **STANDARD ERRORS**
- **CONFIDENCE INTERVALS**
- **Z-TEST**
- **F-TEST**
- **T-TEST**
- **1 - WAY ANOVA**
- **TUKEY TEST**



Standard Errors

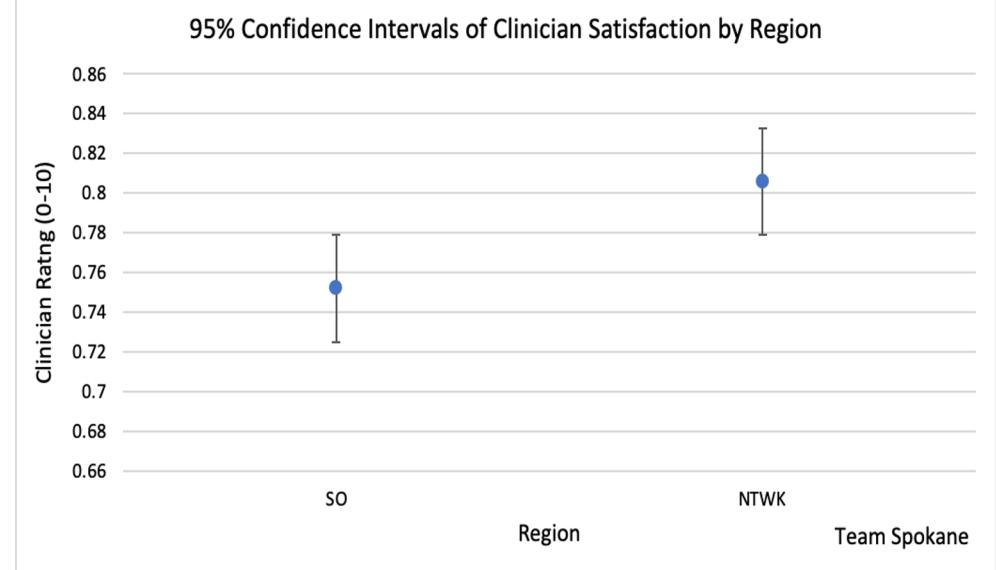
Calculate standard errors for a Z-test performed for the Clinician rating(0-10) in two regions- South and Network.

| Region | Standard Deviation | Sqrt(Count of Sample set) | Standard Error |
|--------|--------------------|---------------------------|----------------|
| SO | 0.115013968 | 7.348469228 | 0.015651419 |
| NTWK | 0.085453828 | 4.123105626 | 0.020725598 |

Confidence Intervals

Calculate confidence intervals for a Z-test performed for the Clinician rating(0-10) in two regions- South and Network.

| Region | Upper Limit | Lower Limit | Mean |
|--------|-------------|-------------|------------|
| SO | 0.71428571 | 0.64187743 | 0.75196256 |
| NTWK | 0.86204768 | 0.64187743 | 0.80581755 |



z-test



H_1 : There is a statistically significant difference between mean clinician rating in CENT region and SO region.

H_0 : There is no statistically significant difference between mean clinician rating in CENT region and SO region.

z-Test: Two Sample for Means

| | <i>South</i> | <i>Network</i> |
|------------------------------|--------------|----------------|
| Mean | 0.751963 | 0.805818 |
| Known Variance | 0.012161 | 0.00613 |
| Observations | 66 | 29 |
| Hypothesized Mean Difference | 0 | |
| <i>z</i> | -2.70756 | |
| P($Z \leq z$) one-tail | 0.003389 | |
| z Critical one-tail | 1.644854 | |
| P($Z \leq z$) two-tail | 0.006778 | |
| z Critical two-tail | 1.959964 | |

The absolute value of the test statistic is greater than the two tail critical value and $P < 0.05$ we are able to reject the null that there is no difference in mean clinician satisfaction between the South and Network regions.

f-test



H_1 : There is a statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

H_0 : There is no statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

| | <i>OLY</i> | <i>NGT</i> |
|---------------------|-------------|------------|
| Mean | 0.744955651 | 0.752525 |
| Variance | 0.013387433 | 0.006673 |
| Observations | 23 | 18 |
| df | 22 | 17 |
| F | 2.006260564 | |
| P(F<=f) one-tail | 0.073542955 | |
| F Critical one-tail | 2.208388091 | |

P>.05 There is no difference in the variances in clinician satisfaction between the Northgate and Olympia clinics. Accept the null

t-test



H₁: There is a statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

H₀: There is no statistically significant difference between the variance of distribution in the districts of Olympia and Northgate.

| | <i>OLY</i> | <i>NGT</i> |
|---------------------|--------------|------------|
| Mean | 0.744955651 | 0.75253 |
| Variance | 0.013387433 | 0.00667 |
| Observations | 23 | 18 |
| Pooled Variance | 0.010460555 | |
| Hypothesized Mean D | 0 | |
| df | 39 | |
| t Stat | -0.235181601 | |
| P(T<=t) one-tail | 0.40764916 | |
| t Critical one-tail | 1.684875122 | |
| P(T<=t) two-tail | 0.81529832 | |
| t Critical two-tail | 2.02269092 | |

P>.05 There is no difference in mean clinician satisfaction between the Northgate and Olympia clinics. Accept the null

1-way ANOVA



H₁: There is a statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

H₀: There is no statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

| ANOVA | | | | | | |
|----------------------------|-----------|-----------|-----------|----------|----------------|---------------|
| <i>Source of Variation</i> | <i>SS</i> | <i>df</i> | <i>MS</i> | <i>F</i> | <i>P-value</i> | <i>F crit</i> |
| Between Groups | 0.129147 | 3 | 0.043049 | 5.411105 | 0.002129 | 2.739502 |
| Within Groups | 0.540986 | 68 | 0.007956 | | | |

Null hypothesis: There is no difference in the mean clinician rating across four clinics including Capital Hill, Riverfront, Northgate, and Olympia.

F-Statistic > critical value and P-Value < 0.05, we reject the null hypothesis that there is no significant difference. Tukey test shows where the difference is.

Tukey Test

H_1 : There is a statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

H_0 : There is no statistically significant difference between mean clinician rating within OLY, NGT, RFM and FHC clinics.

The statistical difference is between Olympia & Riverfront and Olympia & Capital Hill.

| critical value at .05 | 0.081702 | | | |
|-----------------------|--------------|-----------|-----------|---------|
| | Capital Hill | Rivefront | Northgate | Olympia |
| Capital Hill | 0.7450 | 0.7525 | 0.8090 | 0.8429 |
| Rivefront | | 0.0076 | 0.0640 | 0.0980 |
| Northgate | | | 0.0564 | 0.0904 |
| Olympia | 0.8429 | | | 0.0340 |

NON-PARAMETRIC STATISTICS

**MANN-WHITNEY
KRUSKAL WALLACE
CHI SQUARE STATISTIC**

Mann-Whitney

| Clinic | Clinician Rating | Rank | SUM SNOH | 50 r1 | | |
|--------|------------------|------|--|--|--|--|
| BRN | 0.875 | 4 | Sum KIT | 86 r2 | | |
| BRN | 0.827586207 | 7 | Count SNOH | 7 n1 | H_1 : There is a statistically significant difference between clinician rating medians within BRN and EVM clinics. | H_0 : There is no statistically significant difference between median clinician rating within BRN and EVM clinics. |
| BRN | 0.912280702 | 2 | Count KIT | 9 n2 | | |
| BRN | 0.8125 | 10 | | | | |
| BRN | 0.888888889 | 3 | | | | |
| BRN | 0.540540541 | 16 | $u_1 = n_1 * n_2 + n_2(n_2+1)/2 - r_2$ | | | |
| BRN | 0.823529412 | 8 | $u_2 = n_1 * n_2 + n_1(n_1+1)/2 - r_1$ | | | |
| EVM | 0.82 | 9 | | | | |
| EVM | 0.692307692 | 13 | | | | |
| EVM | 0.611111111 | 15 | u_1 | 22 | | |
| EVM | 0.871428571 | 5 | u_2 | 41 | | |
| EVM | 0.931506849 | 1 | | | | |
| EVM | 0.666666667 | 14 | Use a Mann Whitney alpha=0.05 In our case we have 7 and 9 observation which yields a critical statistic of 5 | | | |
| EVM | 0.75862069 | 11 | | | | |
| EVM | 0.87037037 | 6 | | | | |
| EVM | 0.714285714 | 12 | 22 > 5 | so we can NOT reject the null hypothesis | Null hypothesis: There is no difference in the medians of clinician ratings between BRN and EVM clinics. | |

H_1 : There is a statistically significant difference between clinician rating medians within BRN and EVM clinics.

H_0 : There is no statistically significant difference between median clinician rating within BRN EVM clinics.

Kruskal Wallace

| Clinic | Clinician Rating | Rank | | SNOH | CDA | EVM | | | | | | |
|--|------------------|------|---------------------------|-------------|-------------|---|---------|--|--|--|--|--|
| BRN | 0.875 | 5 | count | 7 | 3 | 9 | | | | | | |
| BRN | 0.827586207 | 9 | sum ranks | 60.5 | 24.5 | 105 | | | | | | |
| BRN | 0.912280702 | 2 | sum ranks squared | 3660.25 | 600.25 | 11025 | | | | | | |
| BRN | 0.8125 | 12 | sum ranks squared / count | 522.8928571 | 200.0833333 | 1225 | 1947.98 | | | | | |
| BRN | 0.888888889 | 3.5 | | | | | | | | | | |
| BRN | 0.540540541 | 19 | | | | | | | | | | |
| BRN | 0.823529412 | 10 | | | | | | | | | | |
| CDA | 0.807017544 | 13 | | | | | | | | | | |
| CDA | 0.857142857 | 8 | | | | | | | | | | |
| CDA | 0.888888889 | 3.5 | | | | | | | | | | |
| EVM | 0.82 | 11 | | | | | | | | | | |
| EVM | 0.692307692 | 16 | | | | | | | | | | |
| EVM | 0.611111111 | 18 | H = | | 21.51503759 | Chi Square alpha=.05 and 2 degrees of freedom | | | | | | |
| EVM | 0.871428571 | 6 | | | | | | | | | | |
| EVM | 0.931506849 | 1 | | | 5.99 | | | | | | | |
| EVM | 0.666666667 | 17 | | | | 2.128E-05 | P>0.05 | | | | | |
| EVM | 0.75862069 | 14 | | | | | | | | | | |
| EVM | 0.87037037 | 7 | | | | | | | | | | |
| EVM | 0.714285714 | 15 | | | | | | | | | | |
| We may reject the null hypothesis that there is no difference in Clinical Satisfaction medians in the three clinics | | | | | | | | | | | | |
| Null hypothesis: There is no difference in the medians of clinician ratings between the three clinics including BRN, CDA, EVM. | | | | | | | | | | | | |

H_1 : There is a statistically significant difference between clinician rating medians within BRN, CDA, and EVM clinics.

H_0 : There is no statistically significant difference between median clinician rating within BRN, CDA, and EVM clinics.

Chi Square Statistic

| Count of Clinician rating (0-10) | Column Labels | | | | | | |
|----------------------------------|---------------|-----|-----|-----|-----|-----|-------------|
| Row Labels | HCCD | KIT | KNG | OLY | SEA | TAC | Grand Total |
| 0.4482-0.4982 | | 1 | | 1 | | 1 | 3 |
| 0.4982-0.5482 | | 1 | | | | 1 | 2 |
| 0.5482-0.5982 | | | | 1 | | 3 | 4 |
| 0.5982-0.6482 | | 1 | 3 | 2 | 2 | 1 | 9 |
| 0.6482-0.6982 | | 1 | 3 | 2 | 6 | 2 | 14 |
| 0.6982-0.7482 | | 5 | 4 | 4 | 5 | 5 | 27 |
| 0.7482-0.7982 | | 7 | 1 | 5 | 9 | 3 | 30 |
| 0.7982-0.8482 | | 7 | 3 | 6 | 1 | 13 | 9 |
| 0.8482-0.8982 | | 9 | 8 | 11 | 5 | 12 | 47 |
| 0.8982-0.9482 | | 1 | | 4 | 1 | 6 | 12 |
| Grand Total | | 30 | 19 | 36 | 23 | 54 | 187 |

| Count of Clinician rating (0-10) | Column Labels | | | | | | |
|----------------------------------|---------------|-----|-----|-----|-----|-----|-------------|
| Row Labels | HCCD | KIT | KNG | OLY | SEA | TAC | Grand Total |
| 0.4482-0.4982 | | 1 | | 1 | | 1 | 3 |
| 0.4982-0.5482 | | 1 | | | | 1 | 2 |
| 0.5482-0.5982 | | | | 1 | | 3 | 4 |
| 0.5982-0.6482 | | 1 | 3 | 2 | 2 | 1 | 9 |
| 0.6482-0.6982 | | 1 | 3 | 2 | 6 | 2 | 14 |
| 0.6982-0.7482 | | 5 | 4 | 4 | 5 | 5 | 27 |
| 0.7482-0.7982 | | 7 | 1 | 5 | 9 | 3 | 30 |
| 0.7982-0.8482 | | 7 | 3 | 6 | 1 | 13 | 9 |
| 0.8482-0.8982 | | 9 | 8 | 11 | 5 | 12 | 47 |
| 0.8982-0.9482 | | 1 | | 4 | 1 | 6 | 12 |
| Grand Total | | 30 | 19 | 36 | 23 | 54 | 187 |

| Count of Clinician rating (0-10) | Column Labels | | | | | | |
|----------------------------------|---------------|-----|-----|-----|-----|-----|-------------|
| Row Labels | HCCD | KIT | KNG | OLY | SEA | TAC | Grand Total |
| 0.4482-0.5982 | | 1 | 1 | 0 | 2 | 1 | 4 |
| .5982-.6982 | | 0 | 2 | 6 | 4 | 8 | 3 |
| .6982+ | | 29 | 16 | 30 | 17 | 45 | 18 |
| | | 30 | 19 | 36 | 23 | 54 | 187 |
| chi.test | 0.0883 | | | | | | |

| | |
|----------------|---------|
| Chi Square | 16.4177 |
| critical value | 18.3070 |
| probability | 0.0883 |

Hypothesis:

H_1 : There is an association between clinician ratings and the districts at GHP.

H_0 : There is no association between clinician ratings and the districts at GHP.

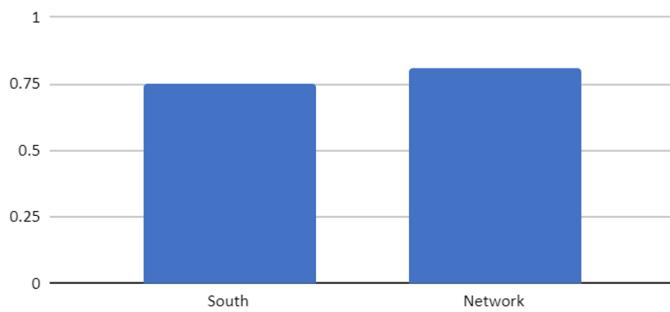
GRAPHS

**DIFFERENCE IN MEANS
DIFFERENCE IN ASSOCIATIONS**

Graphs



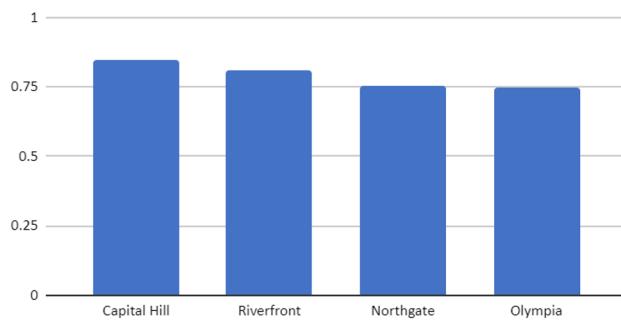
Mean for Regions (Z-Test)



Mean for Clinics (F-Test & T-Test)



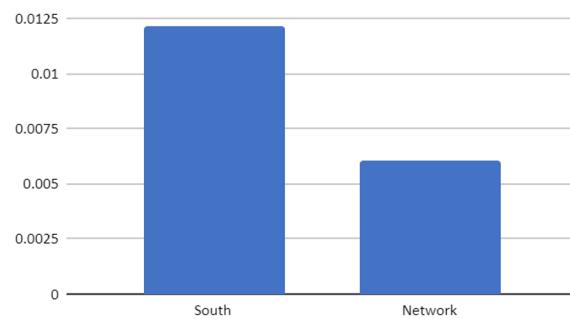
Mean for Clinics (ANOVA)



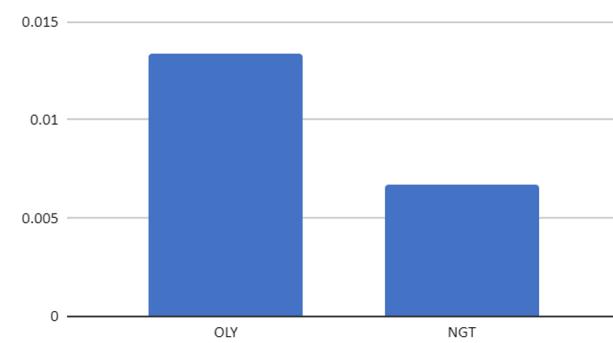
Graphs



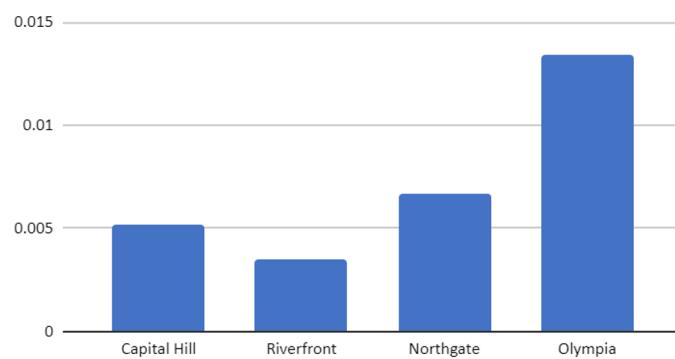
Known Variance for Regions (Z-Test)



Variance for Clinics (F-Test & T-Test)



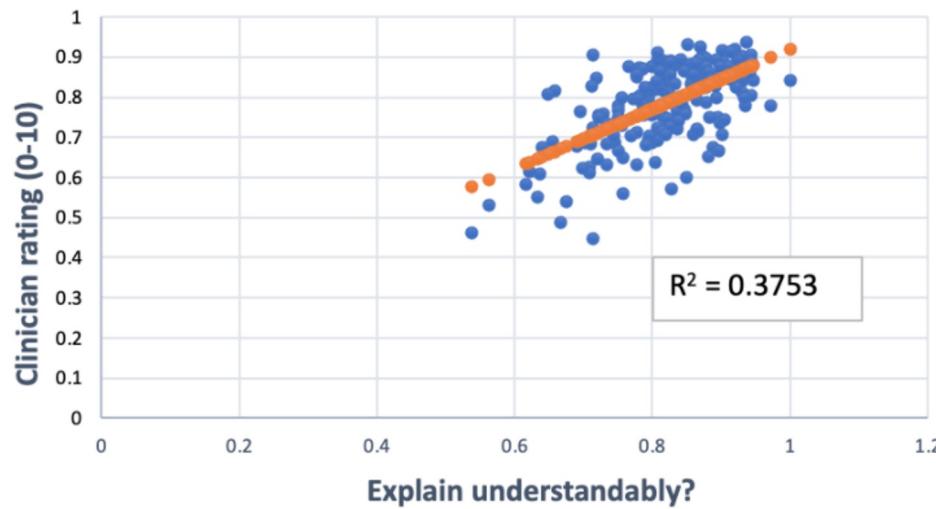
Variance for Clinics (ANOVA)





Correlation Analysis

Clinician Rating vs Explain understandably?





Simple Regression

H_1 : There is a statistically significant relationship between Clinician Rating and Explain Understandably to you?

H_0 : There is not a statistically significant relationship between Clinician Rating and Explain Understandably to you?

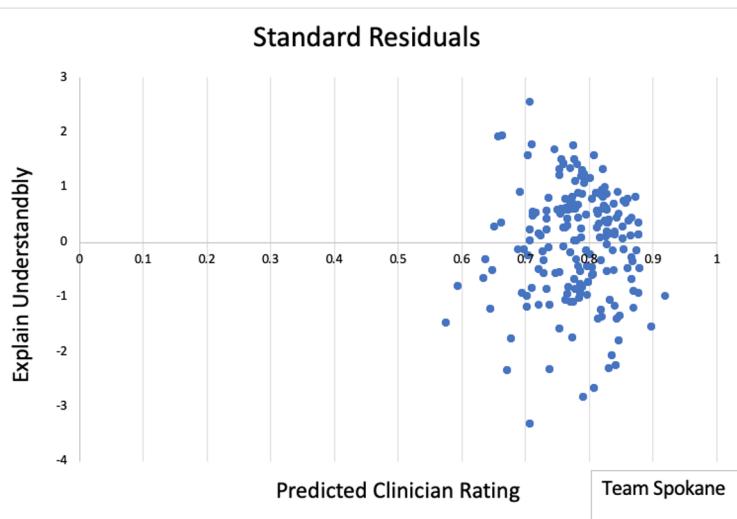


Figure. Scatterplot comparison of Standard Residuals and Predicted Clinician Rating (See Excel: Simple Regression tab)



Simple Regression (cont.)

Table . Simple Regression relationship between Explain Understandably to you? and Clinician Rating (See Excel: Simple Regression tab)

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% |
|-------------------------|--------------|----------------|---------|----------|-----------|-----------|
| Intercept | 0.1750 | 0.0566 | 3.0920 | 0.0023 | 0.0634 | 0.2867 |
| Explain understandably? | 0.7438 | 0.0689 | 10.7951 | 1.41E-21 | 0.6079 | 0.8797 |

P<0.05 means that we can reject the null hypothesis that there is no relationship between clinician rating and Explain Understandably to you, meaning that there is a significant relationship.

Multiple Regressions

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|---------------------------|--------------|----------------|--------|---------|-----------|-----------|-------------|-------------|
| Intercept | 0.021 | 0.055 | 0.375 | 0.708 | -0.088 | 0.129 | -0.088 | 0.129 |
| Explain understandably? | 0.202 | 0.099 | 2.033 | 0.044 | 0.006 | 0.397 | 0.006 | 0.397 |
| Respect what you said? | 0.309 | 0.110 | 2.803 | 0.006 | 0.091 | 0.526 | 0.091 | 0.526 |
| Info to diagnose/treat | -0.032 | 0.084 | -0.388 | 0.699 | -0.198 | 0.133 | -0.198 | 0.133 |
| Knowledge of medical hx | 0.463 | 0.058 | 7.921 | 0.000 | 0.347 | 0.578 | 0.347 | 0.578 |
| Listen carefully to you? | 0.082 | 0.110 | 0.749 | 0.455 | -0.135 | 0.300 | -0.135 | 0.300 |
| Your best interests 1st? | -0.145 | 0.102 | -1.432 | 0.154 | -0.346 | 0.055 | -0.346 | 0.055 |
| Spend enough time w/ you? | 0.091 | 0.075 | 1.210 | 0.228 | -0.057 | 0.239 | -0.057 | 0.239 |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|-------------------------|--------------|----------------|---------|---------|-----------|-----------|-------------|-------------|
| Intercept | -0.0092 | 0.0518 | -0.1784 | 0.8586 | -0.1115 | 0.0930 | -0.1115 | 0.0930 |
| Explain understandably? | 0.2079 | 0.0827 | 2.5149 | 0.0127 | 0.0449 | 0.3710 | 0.0449 | 0.3710 |
| Respect what you said? | 0.3478 | 0.0876 | 3.9715 | 0.0001 | 0.1751 | 0.5205 | 0.1751 | 0.5205 |
| Knowledge of medical hx | 0.4428 | 0.0536 | 8.2550 | 0.0000 | 0.3370 | 0.5486 | 0.3370 | 0.5486 |

| Regression Statistics | |
|-----------------------|--------|
| Multiple R | 0.7742 |
| R Square | 0.5994 |
| Adjusted R Square | 0.5931 |
| Standard Error | 0.0628 |
| Observations | 196 |

Nominal Data

SUMMARY OUTPUT

| Regression Statistics | | Partial F test: 2.197206 | | | |
|-----------------------|-------------|--------------------------|--|---------|----------|
| Multiple R | 0.774190986 | | | 6 | |
| R Square | 0.599371683 | | | 186 | |
| Adjusted R Square | 0.593111865 | | | p value | 0.045103 |
| Standard Error | 0.062789996 | | | | |
| Observations | 196 | | | | |

| ANOVA | | | | | |
|------------|-----|-------------|-----------|----------|----------------|
| | df | SS | MS | F | Significance F |
| Regression | 3 | 1.132496107 | 0.3774987 | 95.74907 | 6.29239E-38 |
| Residual | 192 | 0.756976051 | 0.0039426 | | |
| Total | 195 | 1.889472157 | | | |

| | Coefficients | Standard Error | t Stat | P-value | Lower 95% | Upper 95% | Lower 95.0% | Upper 95.0% |
|-------------------------|--------------|----------------|------------|----------|--------------|-----------|-------------|-------------|
| Intercept | -0.009248917 | 0.051848491 | -0.1783835 | 0.85861 | -0.111514699 | 0.093017 | -0.111515 | 0.0930169 |
| Explain understandably? | 0.207943857 | 0.08268579 | 2.5148681 | 0.012728 | 0.044854696 | 0.371033 | 0.044855 | 0.371033 |
| Respect what you said? | 0.347782431 | 0.087568816 | 3.9715329 | 0.000101 | 0.175062007 | 0.520503 | 0.175062 | 0.5205029 |
| Knowledge of medical hx | 0.442784664 | 0.053638558 | 8.2549696 | 2.4E-14 | 0.336988161 | 0.548581 | 0.336988 | 0.5485812 |

| | | | |
|----------|-----|-------------|-----------|
| Residual | 186 | 0.706874466 | 0.0038004 |
| Total | 195 | 1.889472157 | |

| | Coefficients | Standard Error | t Stat | P-value |
|---------------|--------------|----------------|------------|------------|
| Intercept | 0.01636485 | 0.054682977 | 0.29926776 | 0.76506988 |
| Explain under | 0.19342238 | 0.08157511 | 2.37109554 | 0.01875766 |
| Respect wha | 0.37560749 | 0.086881893 | 4.32319646 | 2.5032E-05 |
| Knowledge o | 0.39534783 | 0.059195267 | 6.67870671 | 2.7044E-10 |
| HCCD | -0.0025493 | 0.014238039 | -0.1790463 | 0.85809622 |
| KITSAP | 0.00332311 | 0.016533118 | 0.20099716 | 0.84092042 |
| KING | 0.01660148 | 0.013322103 | 1.24616068 | 0.21427267 |
| OLYMPIA | -0.0184154 | 0.015411108 | -1.1949447 | 0.23363007 |
| SNOHOMISH | 0.03192434 | 0.022768248 | 1.40214294 | 0.16253926 |
| TACOMA | -0.0332626 | 0.016163902 | -2.057831 | 0.04100126 |

3 scenarios

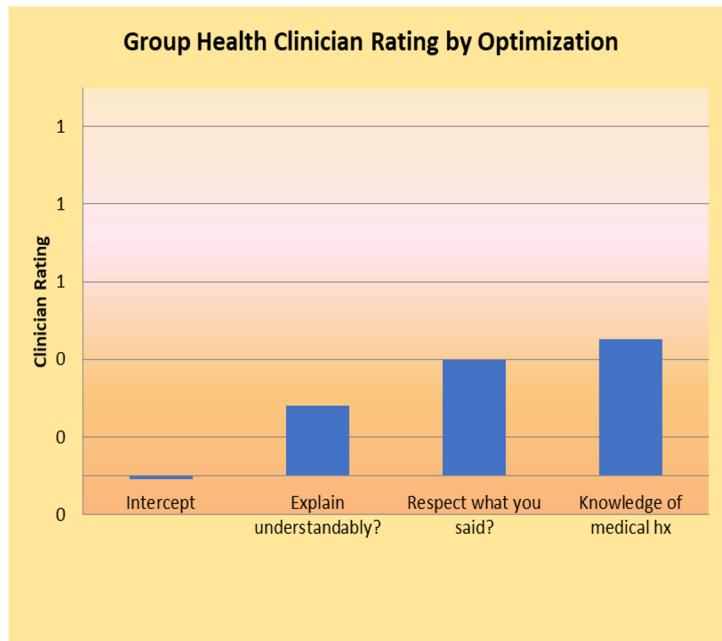
| Scenario Summary | | | | |
|----------------------------|-----------------|---------|---------------|--|
| | Current Values: | Average | Slight Change | |
| Changing Cells: | | | | |
| scn.explain.understandably | 0.8686 | 0.8176 | 0.8686 | |
| scn.respect.what.you.said | 0.8571 | 0.8436 | 0.8571 | |
| scn.knowledge.of.med.hx | 0.7923 | 0.7432 | 0.7923 | |
| Result Cells: | | | | |
| scn.Clinicain.rating | 0.8203 | 0.7833 | 0.8203 | |

Notes: Current Values column represents values of changing cells at time Scenario Summary Report was created. Changing cells for each scenario are highlighted in gray.

| | Explain understandably? | Respect what you said? | Knowledge of medical hx |
|--------------------------|----------------------------|---------------------------|----------------------------|
| 30th | 0.7890 | 0.8167 | 0.6992 |
| 35th | 0.7972 | 0.8246 | 0.7143 |
| 40th | 0.8070 | 0.8387 | 0.7297 |
| 45th | 0.8125 | 0.8462 | 0.7439 |
| 50th | 0.0000 | 0.8571 | 0.7553 |
| 55th | 0.8287 | 0.8639 | 0.7751 |
| 60th | 0.8421 | 0.0000 | 0.7818 |
| 65th | 0.8571 | 0.8776 | 0.7923 |
| 70th | 0.8686 | 0.8871 | 0.8077 |
| Average | 0.8176 | 0.8436 | 0.7432 |
| Average Clinician rating | | | 0.7833 |



Optimization Model





Dynamic Chart

Scenario Inputs

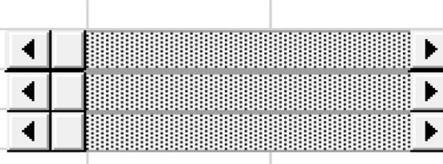
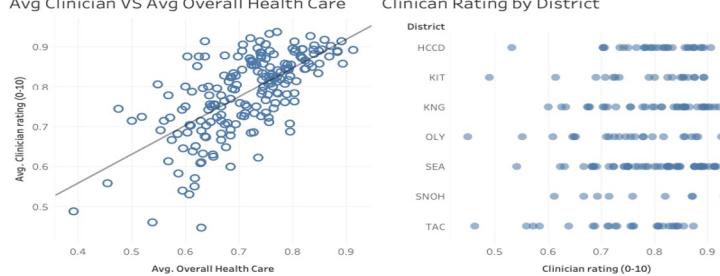
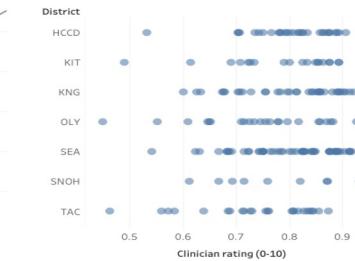
| | | | |
|---|-----------------|---|--------|
| Explain understandably? | 30th Percentile |  | 0.7890 |
| Respect what you said? | 30th Percentile |  | 0.8167 |
| Knowledge of medical hx | 30th Percentile |  | 0.6992 |
| The scenario's new Clinician Satisfaction | | | 0.7598 |

Tableau Dashboard

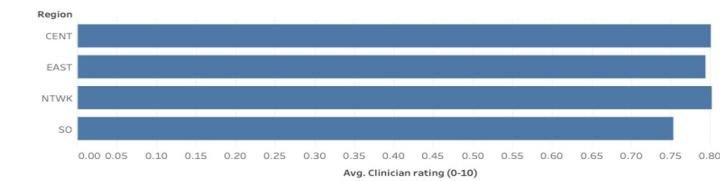
Avg Clinician VS Avg Overall Health Care



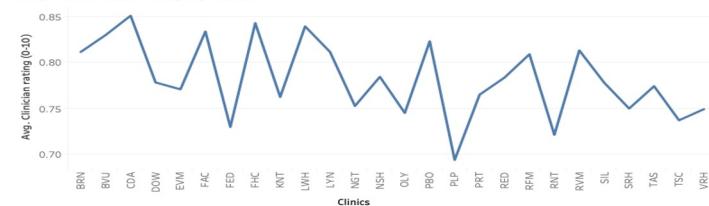
Clinican Rating by District



Avg. Clinician Rating By Region



Avg. Clinican Rating By Clinic





Conclusion

Executive Summary Findings:

- There is no statistically significant difference between the Central and Southern regions when it comes to clinician rating.
- There is a negative correlation between the rating of the clinician and the panel size for each district except for Olympia.
- As panel size increases clinician rating decreases
- There is a positive correlation between the independent continuous variables of ability of clinician to explain understandably and wait time explanation with clinician rating.
- z-test found there is a statistically significant difference between mean clinician rating in the South and Network regions.
- The f-test and t-test uncovered that there is no statistically significant difference between the variance of the distribution and in between the mean clinician rating in the districts of Olympia and Northgate.
- The ANNOA found there to be a difference in mean level clinician satisfaction across the Olympia, Northgate, Riverfront, and Capital Hill clinics, and a Tukey test uncovered that there is significant difference between the mean clinician rating within the four clinics.
- Mann-Whitney proved the clinics of BRN and EVM to have no statistically significant difference between median clinician ratings.
- Kruskal-Wallis proved a statistically significant difference in median clinician ratings between the BRN, CDA, and EVM clinics.
- Correlational analyses hinted at the relationship between providers explaining understandably at the appointment to clinician rating, which was confirmed through regression analysis.
- Regression analysis determined that the provider's knowledge of the patient's medical history in addition to explaining understandably at the appointment contributed to a strong correlation to clinician rating.



Conclusion (cont.)

- **Executive Summary Improvements on Clinician Satisfaction:**
- Group Health to quarterly examine patient satisfaction survey results in relation to clinician satisfaction
- Group Health to initiate quarterly required provider communication trainings
- Group Health to readjust the appointment visit layout and structure to give more time to communicate with the patient
- Group Health to update their electronic medical record system to emphasize the requirement to have extensive knowledge of the patient's medical history when treating the patient.