A look back:

Two Years of Worldwide Sales

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Hypothesis Testing: Methodology

Kurskal-Wallis

- A non-parametric method* for testing whether samples originate from the same distribution.

  *Does not assume a normal distribution of the residuals

- Compares two or more independent samples of equal or different sample sizes using medians to see if there is a **statistically significant interaction.**

A '**p-value**' <.05% indicates statistical significance.

Tukey - Test

- Returns effect size &
- Relative size

Relative size	Effect size	% of control group below the mean of experimental group
	0.0	50%
Small	0.2	58%
Medium	0.5	69%
Large	0.8	79%
	1.4	92%

Sales Data from April 2012 – June 2014	▪ Discounts ▪ Staff ▪ Categories ▪ Regions

Results...

Discounts:

Average Quanity Purchased at Varying Discont Levels
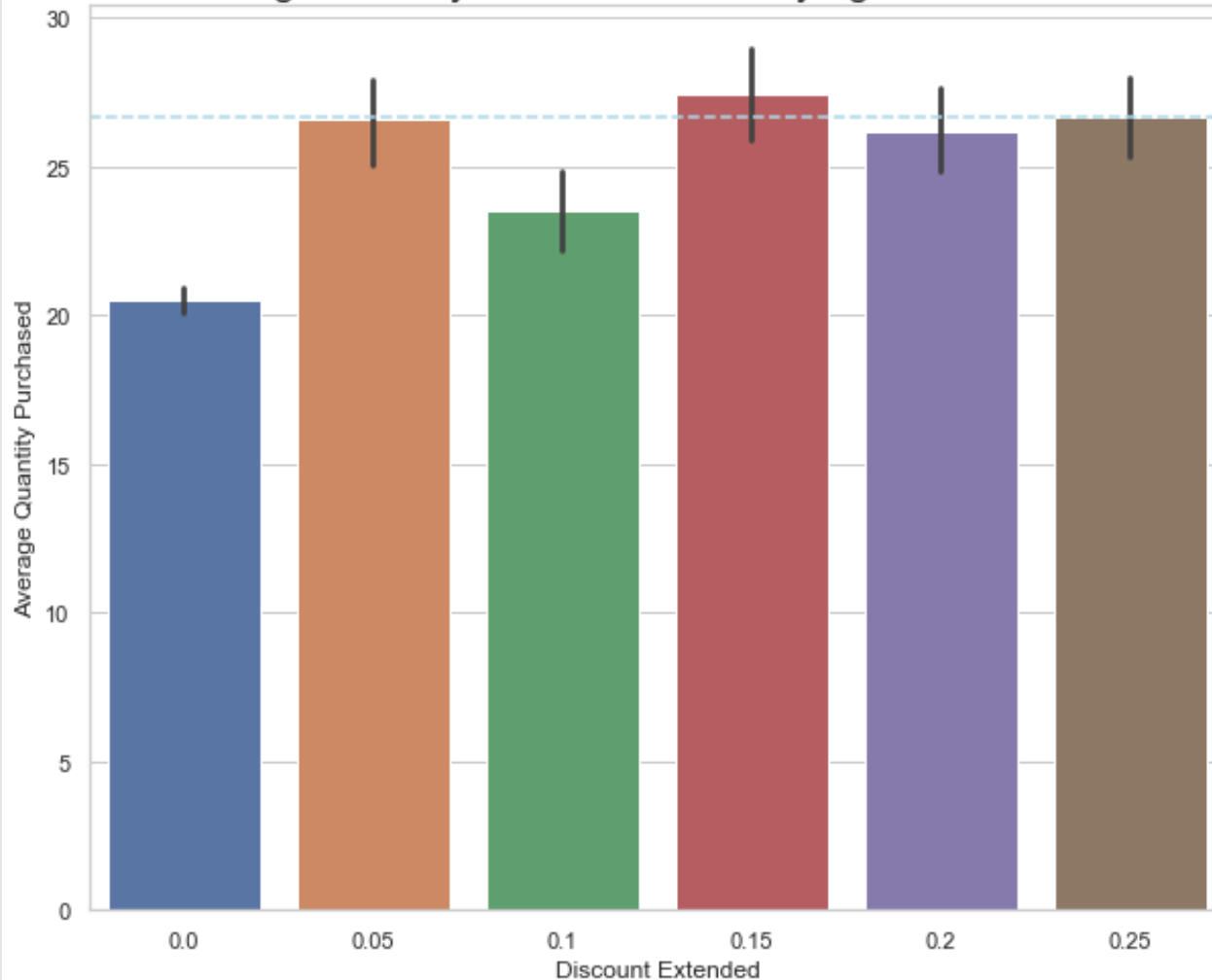
Answer:

Yes, these levels are:

Statistically Equal

Discount	AvQty	Effect Size	Effect
5 %	27	.1982	Small
15 %	27	.454	Medium
20 %	26	.3751	Medium
25 %	27	.454	Medium

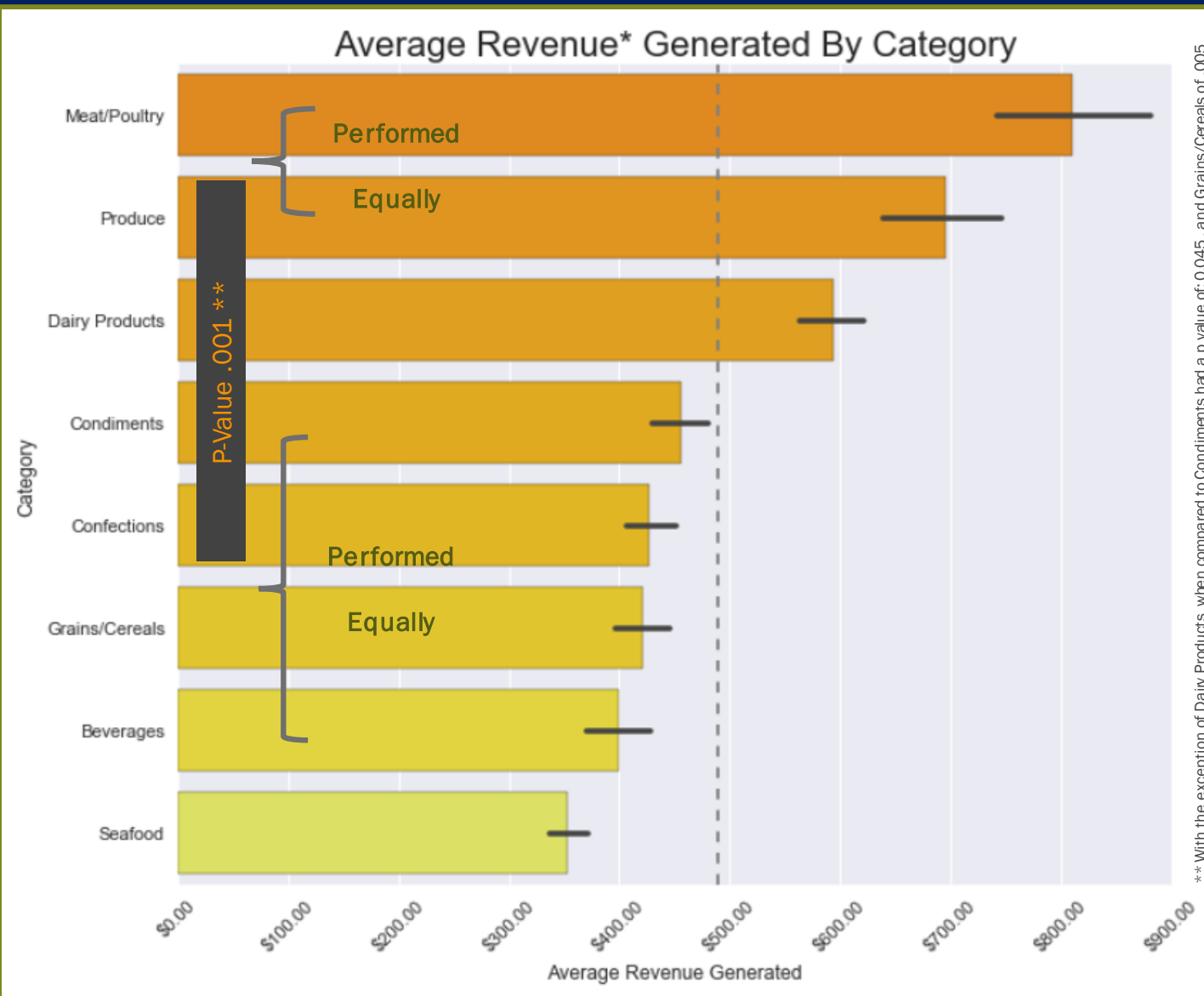P-Value of .001 in comparison to no discount

Recommendation:

- Since the effects of higher discounts are equal to lower in terms of quantity purchased, offer the lower discounts more frequently to preserve profit margins.

Categories:

Average Revenue* Generated By Category

*Revenue is calculated by multiplying sales price and quantity, taking into account discounts.

** With the exception of Dairy Products when compared to Condiments had a p value of: 0.045, and Grains/Cereals of .005

P-Value .001 **

Performed Equally

Performed Equally

Answer:

Yes.
The top three are:
- Meat/Poultry
- Produce
    &
- Dairy

Recommendations:

- Maximize revenues with additional products that align with the higher revenue generating categories.

- Minimize product offerings in lesser generating categories

- Extend discounts accordingly.
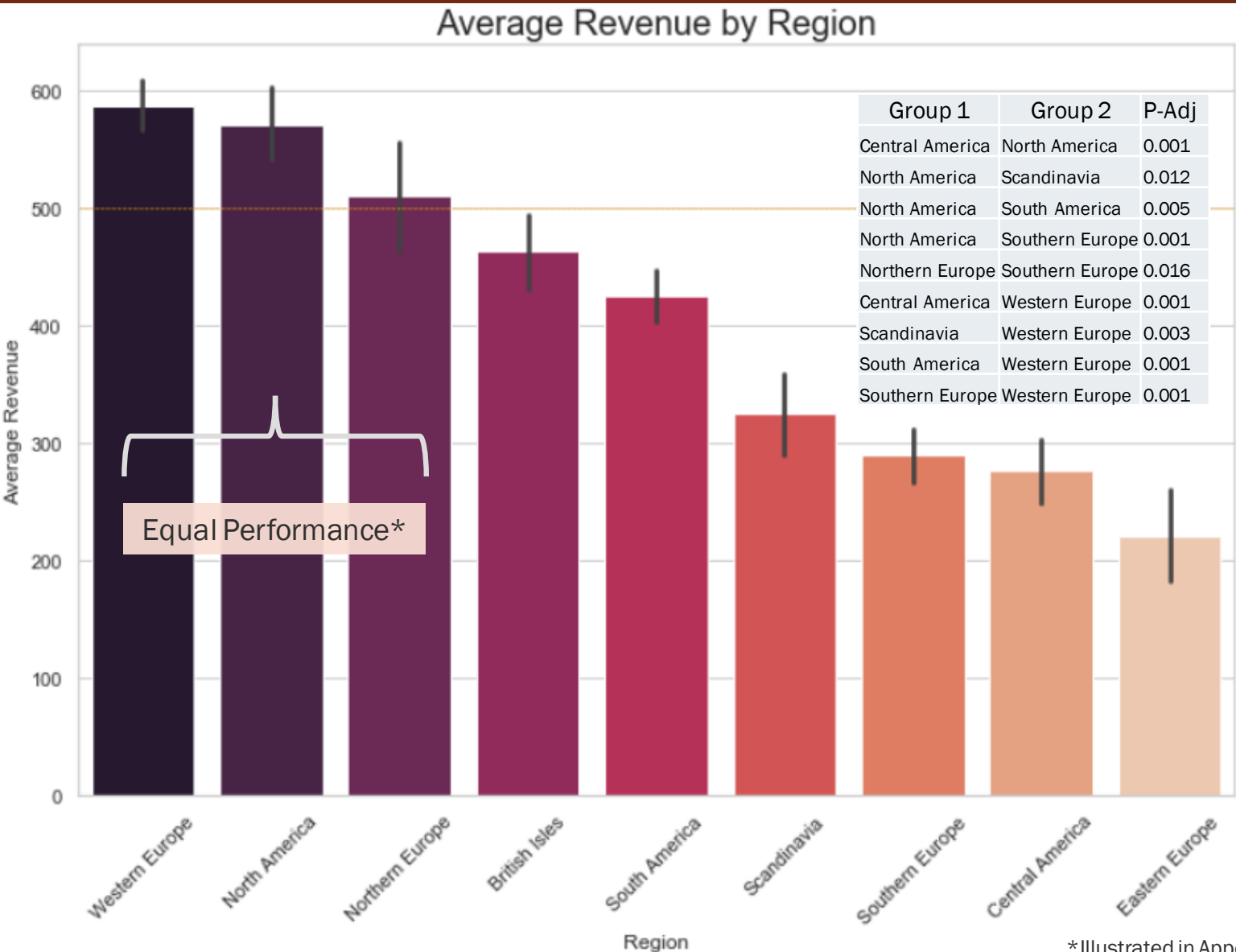
Region:

Answer:

Yes. The top three are :

Western Europe, North America
.... and
Northern Europe

> P Value < .05 indicates a statistical difference

Small sample sizes from Eastern Europe, Scandinavia, Central America*

Recommendation:

- Explore best practices from regions that are top performers via additional market analysis.

- Additional analysis on underdeveloped regions (apply categorical and discount knowledge)

Average Revenue by Region

Group 1	Group 2	P-Adj
Central America	North America	0.001
North America	Scandinavia	0.012
North America	South America	0.005
North America	Southern Europe	0.001
Northern Europe	Southern Europe	0.016
Central America	Western Europe	0.001
Scandinavia	Western Europe	0.003
South America	Western Europe	0.001
Southern Europe	Western Europe	0.001

Equal Performance*

Western Europe, North America, Northern Europe, British Isles, South America, Scandinavia, Southern Europe, Central America, Eastern Europe
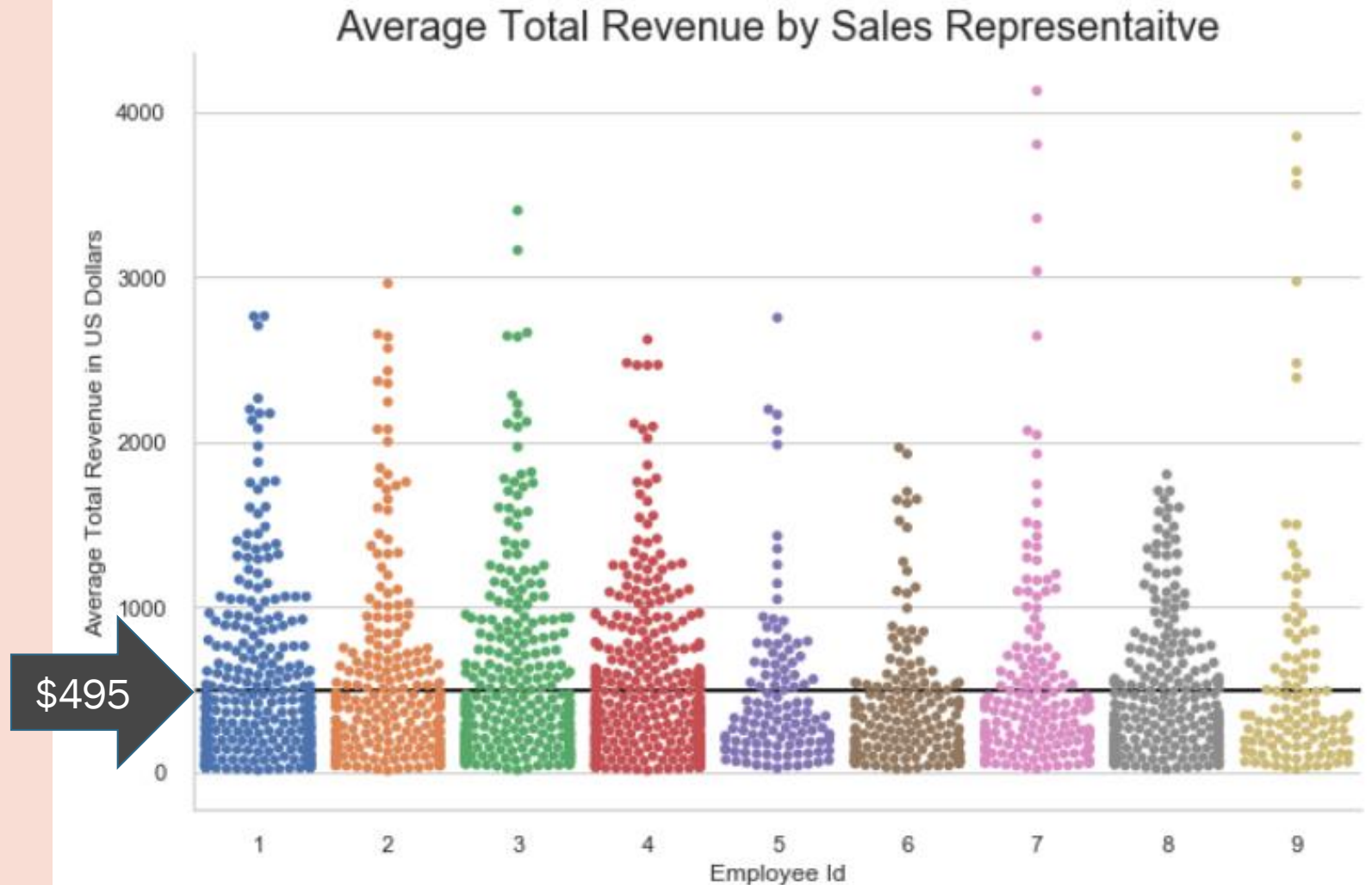
Region

*Illustrated in Appendix

Sales Staff:

Answer:

All sales staff, regardless of location or title statistically generate equal revenue.

Recommendation:

- Build on knowledge of smaller discounts achieving larger quantities.

- Develop regional markets (via analysis - future work?)

Average Total Revenue by Sales Representaitve

$495

Looking Forward:

Maximize Revenues

- Minimize discounts
- Focus on Revenue Generating Categories
- Develop Sales Staff, Underdeveloped Regions

Future Work:

- Market analysis for regions that need to be developed.
  Examples:
  - Regional category refinement
  - Discount types and frequency
  - Sales relationships

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Thank You.

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Appendix:

Region:

Illustrates the difference in confidence intervals of Tukey test. Some regions that visibly look like they out perform others

N. & W. Europe, N. America
Statistically Equal Performance

Region 1	Region 2	Adj P
North America	Northern Europe	0.9000
North America	Western Europe	0.9000
Northern Europe	Western Europe	0.7992

Multiple Comparisons Between All Pairs (Tukey)
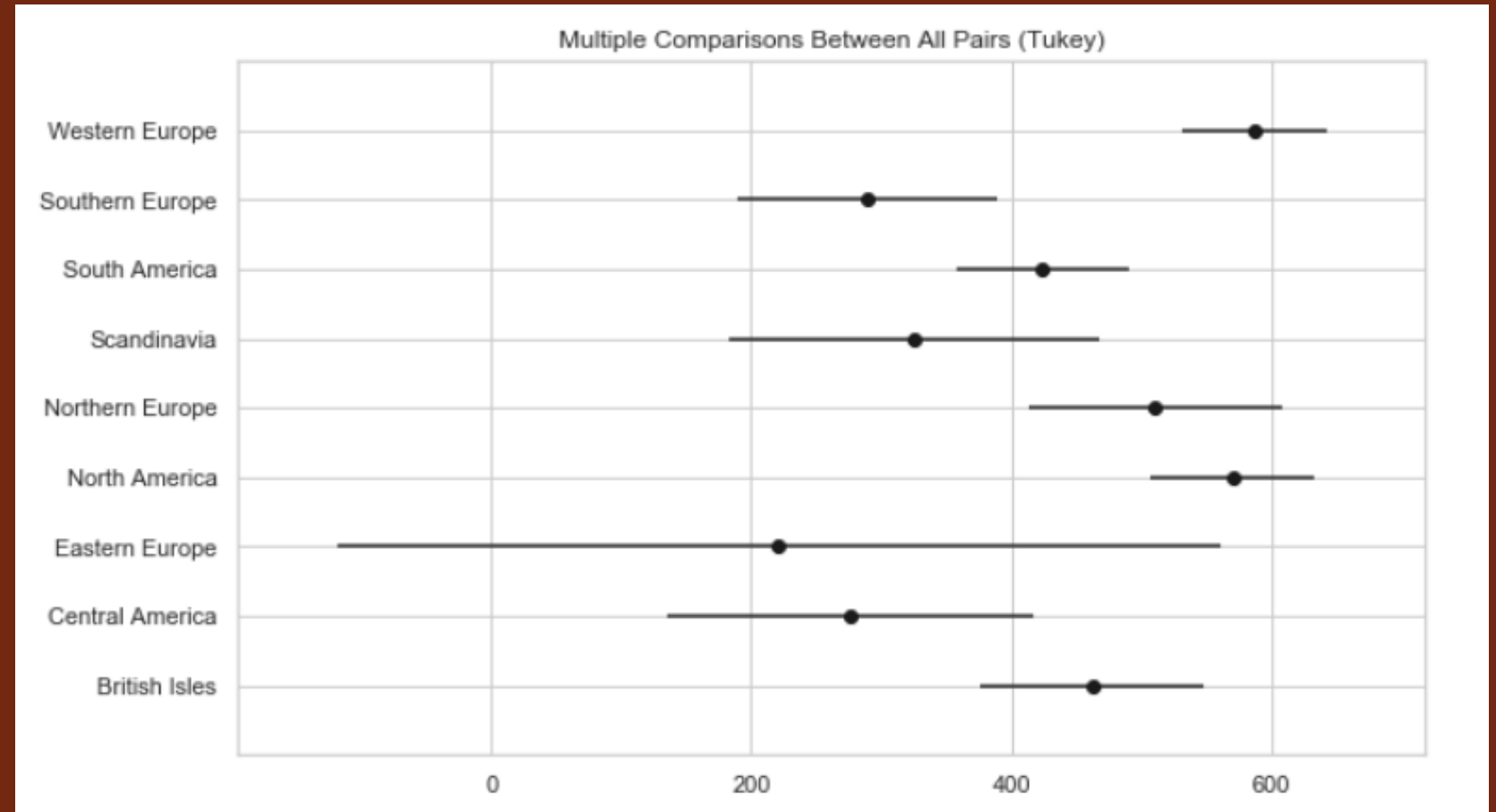
Categories:

Group 1	Group 2	Adj-P	Effect	
Beverages	Dairy Products	0.001	0.352	
Condiments	Dairy Products	0.045	0.277	
Confections	Dairy Products	0.001	0.341	
Dairy Products	Grains/Cereals	0.005	0.350	
Beverages	Meat/Poultry	0.001	0.596	
Condiments	Meat/Poultry	0.001	0.517	
Confections	Meat/Poultry	0.001	0.600	
Dairy Products	Meat/Poultry	0.001	0.311	Reject Null Hypothesis: True
Grains/Cereals	Meat/Poultry	0.001	0.564	
Beverages	Produce	0.001	0.521	
Condiments	Produce	0.001	0.490	
Confections	Produce	0.001	0.560	
Grains/Cereals	Produce	0.001	0.571	
Dairy Products	Seafood	0.001	0.525	
Meat/Poultry	Seafood	0.001	0.755	
Produce	Seafood	0.001	0.798	

Group 1	Group 2	MeanDiff	Adj-P	
Beverages	Condiments	55.7712	0.9	
Beverages	Confections	27.0669	0.9	
Beverages	Grains/Cereals	21.4034	0.9	
Beverages	Seafood	-46.1557	0.9	
Condiments	Confections	-28.7043	0.9	
Condiments	Grains/Cereals	-34.3678	0.9	
Condiments	Seafood	-101.927	0.3439	Reject Null Hypothesis: False
Confections	Grains/Cereals	-5.6635	0.9	
Confections	Seafood	-73.2226	0.6099	
Dairy Products	Produce	102.0142	0.5181	
Grains/Cereals	Seafood	-67.5591	0.831	
Meat/Poultry	Produce	-114.9365	0.5359	
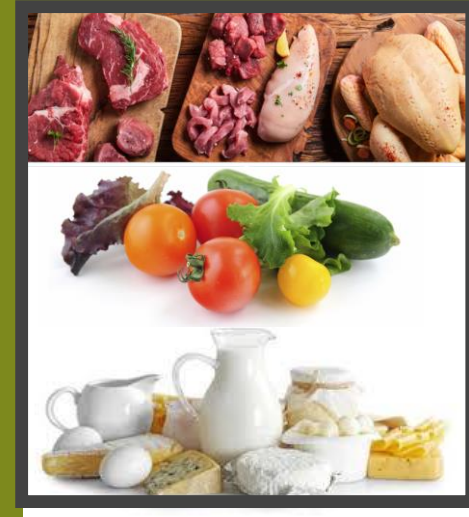
Background:

Worldwide Provisioner
Of Fine Foods

- *77 products, 8 Categories*
- *9 Sales Staff serving 9 Regions Globally*

Statistical Hypothesis Testing Evaluation
Sales from April 2012 – June 2014

- *Discounts*
- *Sales Staff*
- *Sales by Category*
- *Regional Sales*