



**SPOT SPEED MEASUREMENTS FOR A DISCOUNT WHOLESALE, SHOPPING MALL AND GROCERY SHOP**  
**Summary Abstract of Findings**

The University of Nevada, Reno ITE Student Chapter conducted a spot speed measurement for a discount wholesale (ITE Land Use: 861), shopping center (ITE Land Use: 820) and supermarket (ITE Land Use: 850) all located in the Reno area. The locations are shown in the Figures 1, 6 and 9 with their land areas being 24 acres, 60 acres and 50 acres respectively. The data collectors' location and the direction of speed measurements are indicated on the location Maps (circulatory-red and aisle-yellow). Data was collected for three weekdays (Tuesdays, Wednesday, and Thursday) and three weekends (two Saturdays and a Sunday). The weekday data were all collected in the afternoons between 3 pm – 6 pm which was accepted as the peak time for shoppers for any day within the week. The weekend data was collected between 2 pm – 6 pm. In all, 18 students from the UNITE chapter were involved in the data collection. The UNITE president and vice president were responsible for the data analysis.

As a precautionary measure, the data collectors sat in cars to measure the speeds of the target vehicles. This was to prevent the drivers from noticing their speeds being measured and reacting. In the few instances that the drivers spotted the collectors and thus varied their speeds, the data was discarded. During each observation session, at least 200 vehicle speeds were measured for the circulatory traffic except for one where 112 vehicles were collected. Due to pedestrian activities in the frontage of the buildings, the general speeds were below the measurable limits for the speed gun used; hence no data was collected from the frontage.

Figures 2, 3, 4, 5, 7, 8, 10, 11, 12 and 13 show the histograms and cumulative frequency curves for the spot speeds collected. The descriptive statistical data are as shown in the Tables 3, 5, 7, 9, 11, 13, 15, 17, 19 and 21.

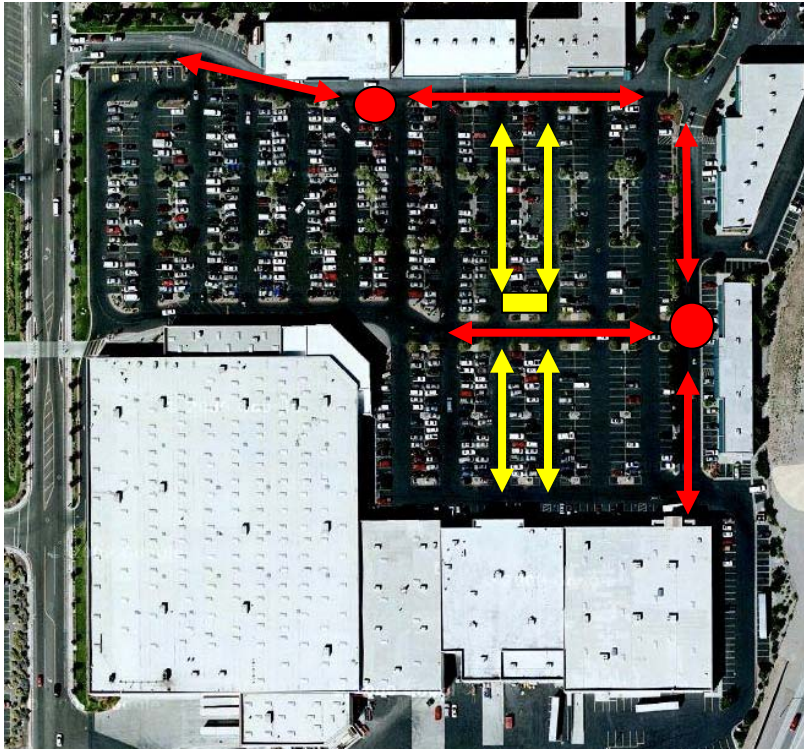
The 85<sup>th</sup> percentile speed ranged from 18 mph - 20 mph for the circulatory vehicles (representing about 95 % of vehicles observed) and 14 mph - 16 mph for the continuous moving vehicles in the aisles i.e. excluding vehicles maneuvering or moving near pedestrians (representing less than 10 % of vehicles observed). The general observation was that the aisle speeds were mostly lower than 10 mph which was below the measurable range for the speed gun used (range 10 mph - 200 mph with accuracy of +/- 1 mph). This was due to the presence of pedestrians and most of the drivers looking for parking spots.

Table 1 below gives a summary of speeds observed for continuously moving vehicles in the circulatory roadways and parking aisles. It however should be noted that these are only results for vehicles with speeds greater than 10 mph.

**Table 1 Summary of Speed Observation for Parking Area Roadways**

|                    | Circulatory Roadway   |            |                          | Parking Aisle         |            |                          |
|--------------------|-----------------------|------------|--------------------------|-----------------------|------------|--------------------------|
|                    | 85th Percentile (mph) | Mean (mph) | Standard Deviation (mph) | 85th Percentile (mph) | Mean (mph) | Standard Deviation (mph) |
| <b>Weekday</b>     |                       |            |                          |                       |            |                          |
| Discount Wholesale | 19                    | 16.3       | 2.8                      | 16                    | 14.1       | 2                        |
| Shopping Center    | 20                    | 17         | 3.2                      |                       |            |                          |
| Supermarket        | 20                    | 16.9       | 3.6                      | 14                    | 12.6       | 2.5                      |
| <b>Weekend</b>     |                       |            |                          |                       |            |                          |
| Discount Wholesale | 18                    | 14.9       | 2.8                      | 14                    | 12.4       | 2.1                      |
| Shopping Center    | 18                    | 14.9       | 2.9                      |                       |            |                          |
| Supermarket        | 20                    | 16.6       | 3.5                      | 15                    | 13         | 2.3                      |

*\*For speeds greater than 10 mph*

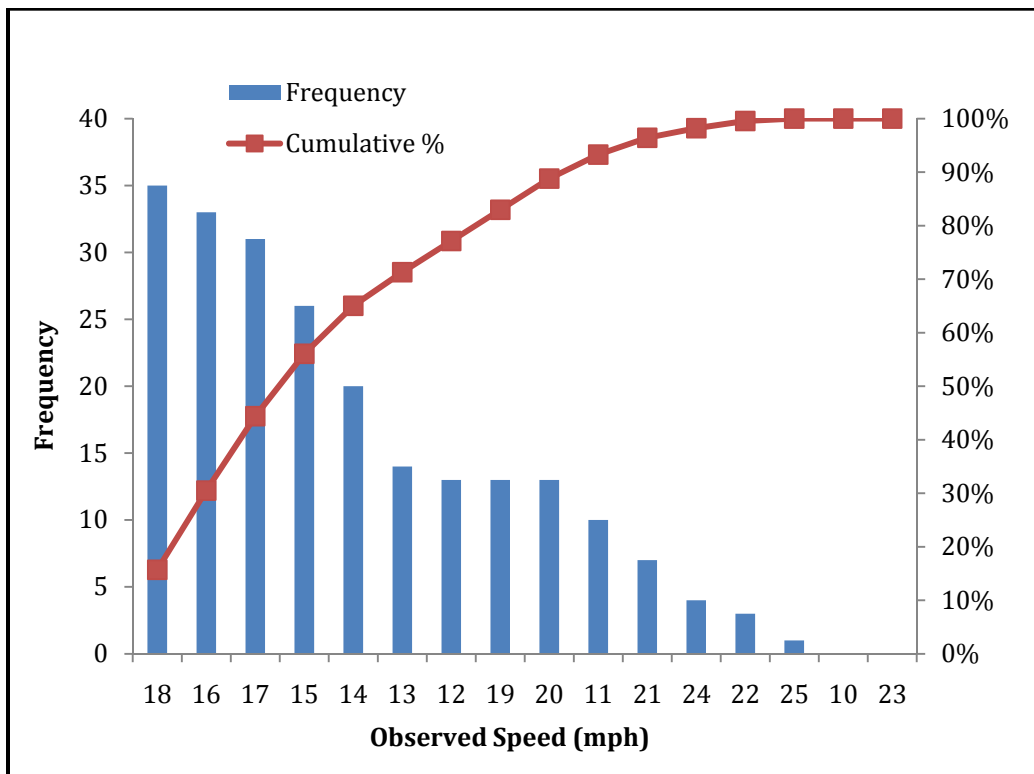


**Figure 1** Aerial Photo of the Discount Wholesale Shopping Center (24 Acres)  
*03/05/2011 and 03/15/2011*

**Table 2 Speed Distribution on Circulatory Road of a Discount Wholesale Shopping Center (Weekday)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 0                | 0.0%                | 18                               | 35               | 16%                 |
| 11                            | 10               | 4.5%                | 16                               | 33               | 30%                 |
| 12                            | 13               | 10.3%               | 17                               | 31               | 44%                 |
| 13                            | 14               | 16.6%               | 15                               | 26               | 56%                 |
| 14                            | 20               | 25.6%               | 14                               | 20               | 65%                 |
| 15                            | 26               | 37.2%               | 13                               | 14               | 71%                 |
| 16                            | 33               | 52.0%               | 12                               | 13               | 77%                 |
| 17                            | 31               | 65.9%               | 19                               | 13               | 83%                 |
| 18                            | 35               | 81.6%               | 20                               | 13               | 89%                 |
| 19                            | 13               | 87.4%               | 11                               | 10               | 93%                 |
| 20                            | 13               | 93.3%               | 21                               | 7                | 96%                 |
| 21                            | 7                | 96.4%               | 24                               | 4                | 98%                 |
| 22                            | 3                | 97.8%               | 22                               | 3                | 100%                |
| 23                            | 0                | 97.8%               | 25                               | 1                | 100%                |
| 24                            | 4                | 99.6%               | 10                               | 0                | 100%                |
| 25                            | 1                | 100.0%              | 23                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 2 Histogram of Speed Distribution on Circulatory Road of a Discount Wholesale Shopping Center (Weekday)**

*\*For speeds greater than 10 mph*

**Table 3 Speed Data on Circulatory Road of a Discount Wholesale Shopping Center  
(Weekday)**

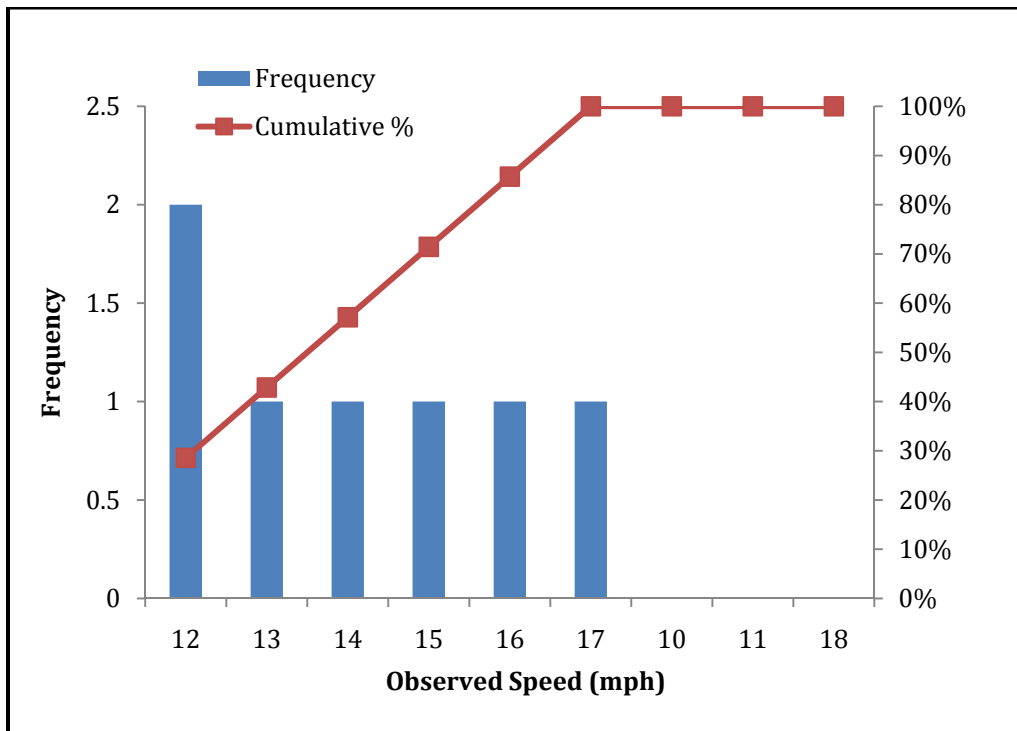
| <b>Statistical Measure</b> | <b>Value</b> |
|----------------------------|--------------|
| Mean                       | 16.3         |
| Standard Error             | 0.2          |
| Median                     | 16           |
| Mode                       | 18           |
| Standard Deviation         | 2.8          |
| Sample Variance            | 8.0          |
| Kurtosis                   | 0.1          |
| Skewness                   | 0.3          |
| Range                      | 14           |
| Minimum                    | 11           |
| Maximum                    | 25           |
| Sum                        | 3644         |
| Count                      | 222          |
| 85th Percentile Speed      | 19 mph       |
| Confidence Level (95.0%)   | 0.37         |

*\*For speeds greater than 10 mph*

**Table 4 Speed Distribution on Aisle of a Discount Wholesale Shopping Center (Weekday)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 0                | 0.0%                | 12                               | 2                | 29%                 |
| 11                            | 0                | 0.0%                | 13                               | 1                | 43%                 |
| 12                            | 2                | 28.6%               | 14                               | 1                | 57%                 |
| 13                            | 1                | 42.9%               | 15                               | 1                | 71%                 |
| 14                            | 1                | 57.1%               | 16                               | 1                | 86%                 |
| 15                            | 1                | 71.4%               | 17                               | 1                | 100%                |
| 16                            | 1                | 85.7%               | 10                               | 0                | 100%                |
| 17                            | 1                | 100.0%              | 11                               | 0                | 100%                |
| 18                            | 0                | 100.0%              | 18                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 3 Histogram of Speed Distribution on Aisle of a Discount Wholesale Shopping Center (Weekday)**

*\*For speeds greater than 10 mph*

**Table 5 Speed Data on Aisle of a Discount Wholesale Shopping Center (Weekday)**

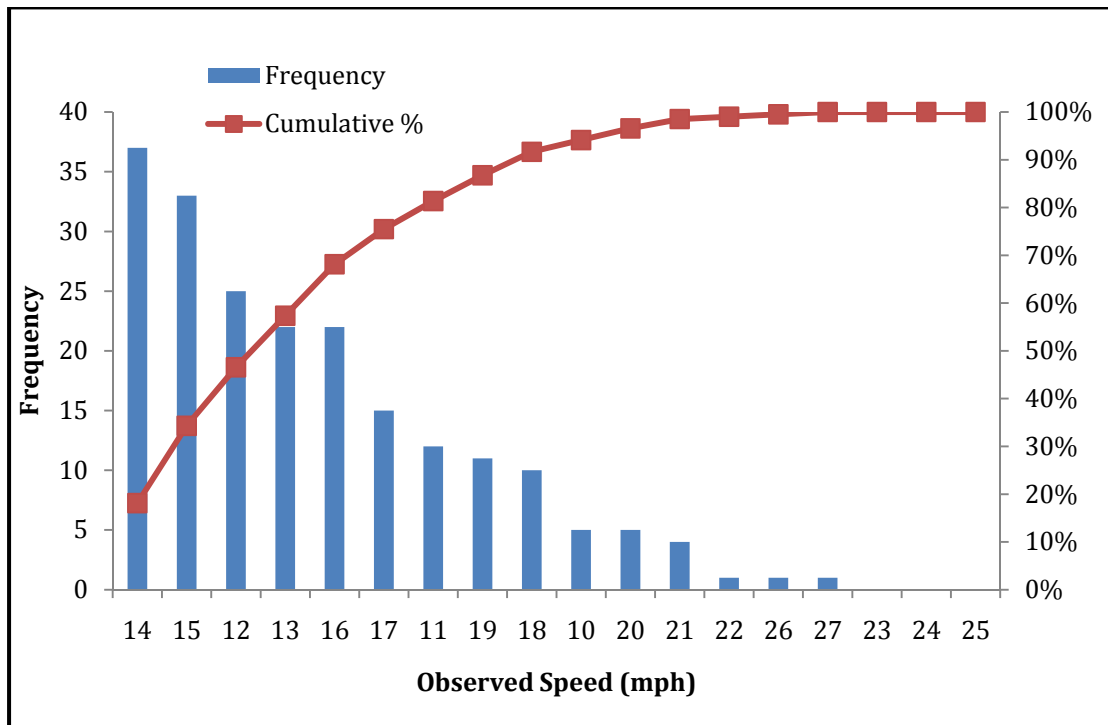
| <b><i>Statistical Measure</i></b> | <b><i>Value</i></b> |
|-----------------------------------|---------------------|
| Mean                              | 14.1                |
| Standard Error                    | 0.7                 |
| Median                            | 14                  |
| Mode                              | 12                  |
| Standard Deviation                | 2.0                 |
| Sample Variance                   | 3.8                 |
| Kurtosis                          | -1.4                |
| Skewness                          | 0.3                 |
| Range                             | 5                   |
| Minimum                           | 12                  |
| Maximum                           | 17                  |
| Sum                               | 99                  |
| Count                             | 6                   |
| 85th Percentile Speed             | 16 mph              |
| Confidence Level (95.0%)          | 1.81                |

*\*For speeds greater than 10 mph*

**Table 6 Speed Distribution on Circulatory Road of a Discount Wholesale Shopping Center (Weekend)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 5                | 2.5%                | 14                               | 37               | 18%                 |
| 11                            | 12               | 8.3%                | 15                               | 33               | 34%                 |
| 12                            | 25               | 20.6%               | 12                               | 25               | 47%                 |
| 13                            | 22               | 31.4%               | 13                               | 22               | 57%                 |
| 14                            | 37               | 49.5%               | 16                               | 22               | 68%                 |
| 15                            | 33               | 65.7%               | 17                               | 15               | 75%                 |
| 16                            | 22               | 76.5%               | 11                               | 12               | 81%                 |
| 17                            | 15               | 83.8%               | 19                               | 11               | 87%                 |
| 18                            | 10               | 88.7%               | 18                               | 10               | 92%                 |
| 19                            | 11               | 94.1%               | 10                               | 5                | 94%                 |
| 20                            | 5                | 96.6%               | 20                               | 5                | 97%                 |
| 21                            | 4                | 98.5%               | 21                               | 4                | 99%                 |
| 22                            | 1                | 99.0%               | 22                               | 1                | 99%                 |
| 23                            | 0                | 99.0%               | 26                               | 1                | 100%                |
| 24                            | 0                | 99.0%               | 27                               | 1                | 100%                |
| 25                            | 0                | 99.0%               | 23                               | 0                | 100%                |
| 26                            | 1                | 99.5%               | 24                               | 0                | 100%                |
| 27                            | 1                | 100.0%              | 25                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 4 Histogram of Speed Distribution on Circulatory Road of a Discount Wholesale Shopping Center (Weekend)**

*\*For speeds greater than 10 mph*



**Table 7 Speed Data on Circulatory Road of a Discount Wholesale Shopping Center  
(Weekend)**

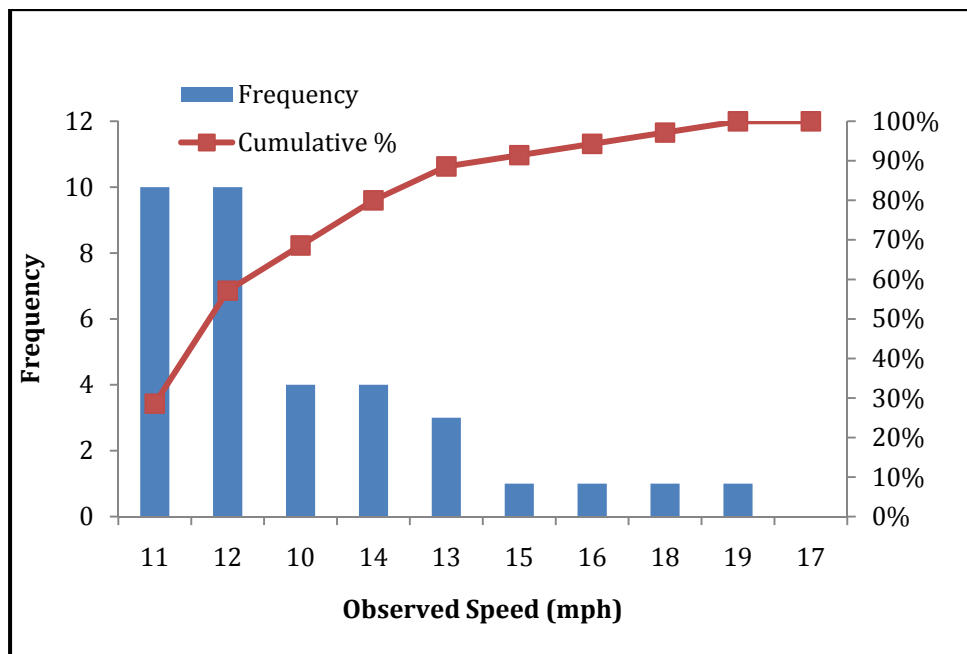
| <i>Statistical Measure</i> | <i>Value</i> |
|----------------------------|--------------|
| Mean                       | 14.9         |
| Standard Error             | 0.2          |
| Median                     | 15           |
| Mode                       | 14           |
| Standard Deviation         | 2.8          |
| Sample Variance            | 7.9          |
| Kurtosis                   | 1.9          |
| Skewness                   | 1.0          |
| Range                      | 17           |
| Minimum                    | 10           |
| Maximum                    | 27           |
| Sum                        | 3036         |
| Count                      | 203          |
| 85th Percentile Speed      | 18 mph       |
| Confidence Level (95.0%)   | 0.39         |

*\*For speeds greater than 10 mph*

**Table 8 Speed Distribution on Aisle of a Discount Wholesale Shopping Center (Weekend)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 4                | 11.4%               | 11                               | 10               | 29%                 |
| 11                            | 10               | 40.0%               | 12                               | 10               | 57%                 |
| 12                            | 10               | 68.6%               | 10                               | 4                | 69%                 |
| 13                            | 3                | 77.1%               | 14                               | 4                | 80%                 |
| 14                            | 4                | 88.6%               | 13                               | 3                | 89%                 |
| 15                            | 1                | 91.4%               | 15                               | 1                | 91%                 |
| 16                            | 1                | 94.3%               | 16                               | 1                | 94%                 |
| 17                            | 0                | 94.3%               | 18                               | 1                | 97%                 |
| 18                            | 1                | 97.1%               | 19                               | 1                | 100%                |
| 19                            | 1                | 100.0%              | 17                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



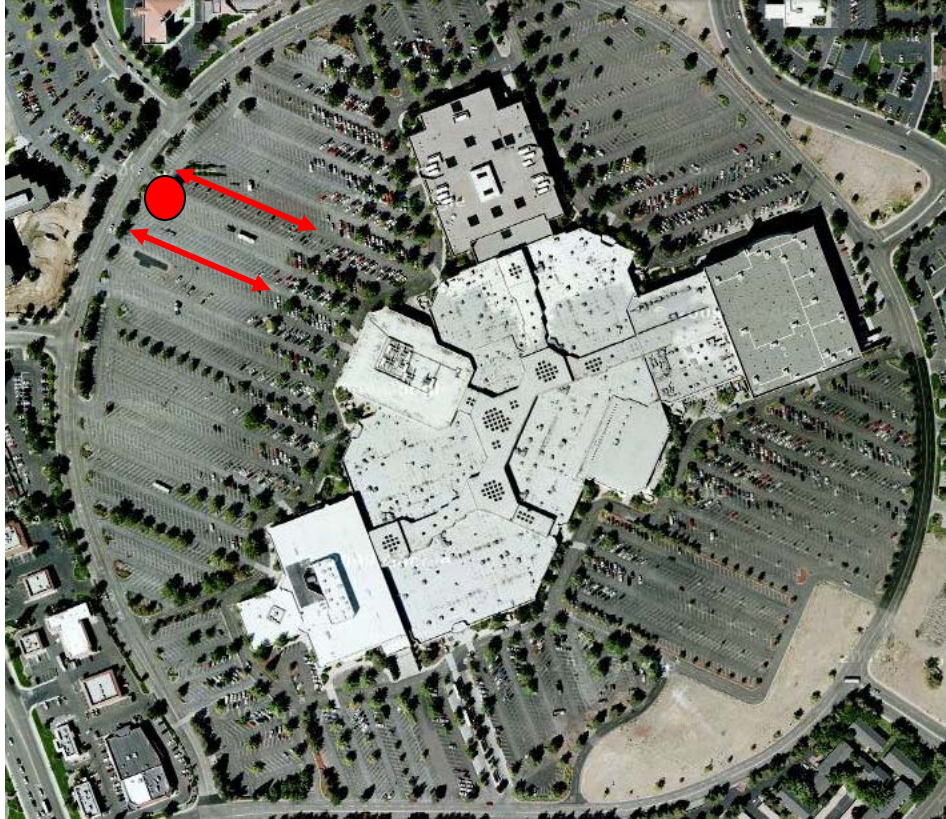
**Figure 5 Histogram of Speed Distribution on Aisle of a Discount Wholesale Shopping Center (Weekday)**

*\*For speeds greater than 10 mph*

**Table 9 Speed Data on Aisle of a Discount Wholesale Shopping Center (Weekend)**

| <i>Statistical Measure</i> | <i>Value</i> |
|----------------------------|--------------|
| Mean                       | 12.4         |
| Standard Error             | 0.4          |
| Median                     | 12           |
| Mode                       | 11           |
| Standard Deviation         | 2.1          |
| Sample Variance            | 4.4          |
| Kurtosis                   | 2.7          |
| Skewness                   | 1.6          |
| Range                      | 9            |
| Minimum                    | 10           |
| Maximum                    | 19           |
| Sum                        | 433          |
| Count                      | 34           |
| 85th Percentile Speed      | 14 mph       |
| Confidence Level (95.0%)   | 0.72         |

*\*For speeds greater than 10 mph*

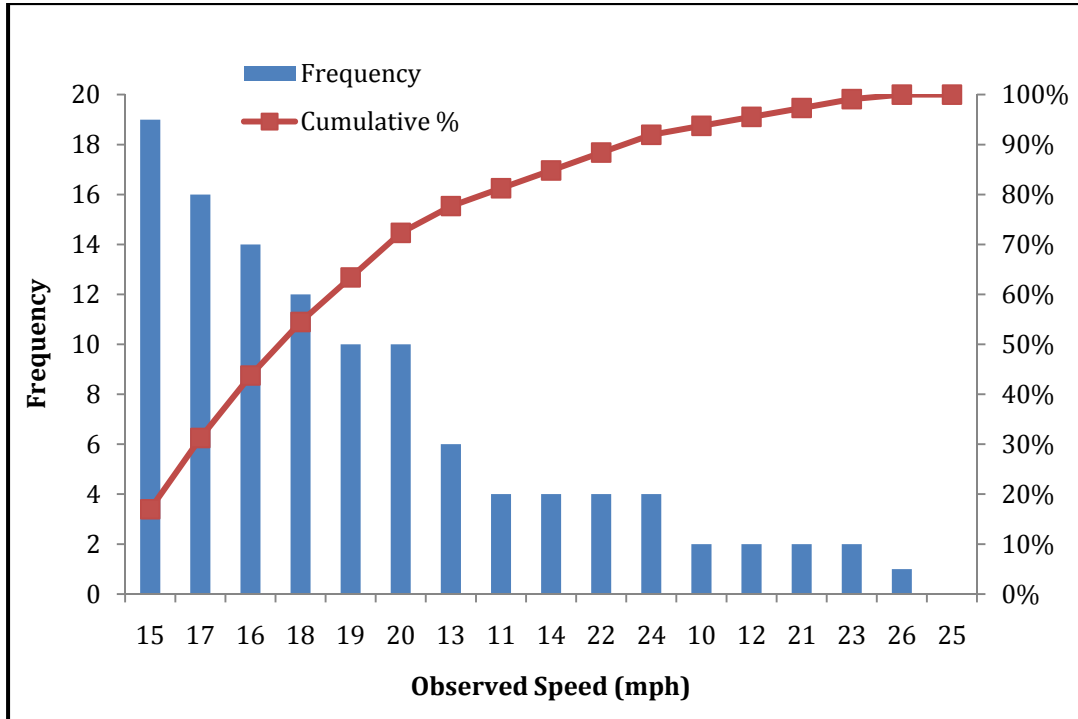


**Figure 6 Aerial Photo of Shopping Center (60 Acres)**  
*03/16/2011 and 03/19/2011*

**Table 10 Speed Distribution on Circulatory Road of a Shopping Center (Weekday)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 2                | 1.8%                | 15                               | 19               | 17%                 |
| 11                            | 4                | 5.4%                | 17                               | 16               | 31%                 |
| 12                            | 2                | 7.1%                | 16                               | 14               | 44%                 |
| 13                            | 6                | 12.5%               | 18                               | 12               | 54%                 |
| 14                            | 4                | 16.1%               | 19                               | 10               | 63%                 |
| 15                            | 19               | 33.0%               | 20                               | 10               | 72%                 |
| 16                            | 14               | 45.5%               | 13                               | 6                | 78%                 |
| 17                            | 16               | 59.8%               | 11                               | 4                | 81%                 |
| 18                            | 12               | 70.5%               | 14                               | 4                | 85%                 |
| 19                            | 10               | 79.5%               | 22                               | 4                | 88%                 |
| 20                            | 10               | 88.4%               | 24                               | 4                | 92%                 |
| 21                            | 2                | 90.2%               | 10                               | 2                | 94%                 |
| 22                            | 4                | 93.8%               | 12                               | 2                | 96%                 |
| 23                            | 2                | 95.5%               | 21                               | 2                | 97%                 |
| 24                            | 4                | 99.1%               | 23                               | 2                | 99%                 |
| 25                            | 0                | 99.1%               | 26                               | 1                | 100%                |
| 26                            | 1                | 100.0%              | 25                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 7 Histogram of Speed Distribution on Circulatory Road of a Shopping Center (Weekday)**

*\*For speeds greater than 10 mph*

**Table 11 Speed Data on Circulatory Road of a Shopping Center (Weekday)**

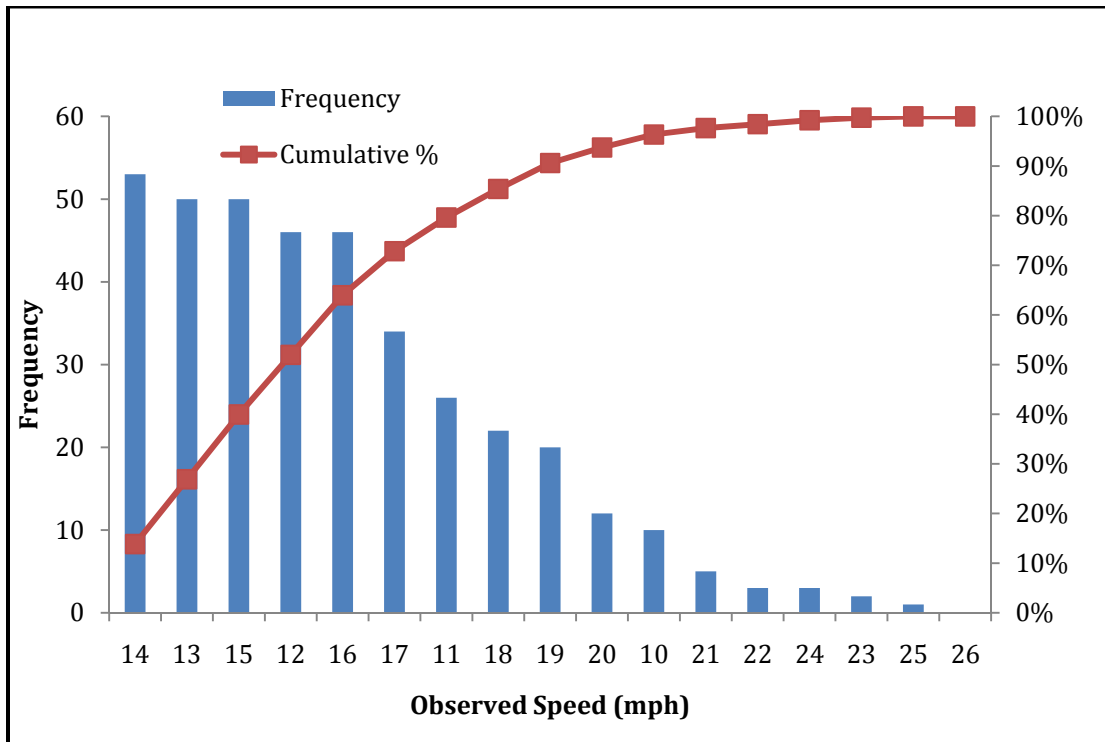
| <b><i>Statistical Measure</i></b> | <b><i>Value</i></b> |
|-----------------------------------|---------------------|
| Mean                              | 17.0                |
| Standard Error                    | 0.3                 |
| Median                            | 17                  |
| Mode                              | 15                  |
| Standard Deviation                | 3.2                 |
| Sample Variance                   | 10.2                |
| Kurtosis                          | 0.2                 |
| Skewness                          | 0.3                 |
| Range                             | 16                  |
| Minimum                           | 10                  |
| Maximum                           | 26                  |
| Sum                               | 1907                |
| Count                             | 111                 |
| 85th Percentile Speed             | 20 mph              |
| Confidence Level (95.0%)          | 0.60                |

*\*For speeds greater than 10 mph*

**Table 12 Speed Distribution on Circulatory Road of a Shopping Center (Weekend)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 10               | 2.6%                | 14                               | 53               | 14%                 |
| 11                            | 26               | 9.4%                | 13                               | 50               | 27%                 |
| 12                            | 46               | 21.4%               | 15                               | 50               | 40%                 |
| 13                            | 50               | 34.5%               | 12                               | 46               | 52%                 |
| 14                            | 53               | 48.3%               | 16                               | 46               | 64%                 |
| 15                            | 50               | 61.4%               | 17                               | 34               | 73%                 |
| 16                            | 46               | 73.4%               | 11                               | 26               | 80%                 |
| 17                            | 34               | 82.2%               | 18                               | 22               | 85%                 |
| 18                            | 22               | 88.0%               | 19                               | 20               | 91%                 |
| 19                            | 20               | 93.2%               | 20                               | 12               | 94%                 |
| 20                            | 12               | 96.3%               | 10                               | 10               | 96%                 |
| 21                            | 5                | 97.7%               | 21                               | 5                | 98%                 |
| 22                            | 3                | 98.4%               | 22                               | 3                | 98%                 |
| 23                            | 2                | 99.0%               | 24                               | 3                | 99%                 |
| 24                            | 3                | 99.7%               | 23                               | 2                | 100%                |
| 25                            | 1                | 100.0%              | 25                               | 1                | 100%                |
| 26                            | 0                | 100.0%              | 26                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 8 Histogram of Speed Distribution on Circulatory Road of a Shopping Center (Weekend)**

*\*For speeds greater than 10 mph*

**Table 13 Speed Data on Circulatory Road of a Shopping Center (Weekend)**

| <b>Statistical Measure</b> | <b>Value</b> |
|----------------------------|--------------|
| Mean                       | 14.9         |
| Standard Error             | 0.1          |
| Median                     | 15           |
| Mode                       | 14           |
| Standard Deviation         | 2.9          |
| Sample Variance            | 8.2          |
| Kurtosis                   | 0.4          |
| Skewness                   | 0.7          |
| Range                      | 15           |
| Minimum                    | 10           |
| Maximum                    | 25           |
| Sum                        | 5724         |
| Count                      | 382          |
| 85th Percentile Speed      | 18 mph       |
| Confidence Level (95.0%)   | 0.29         |

*\*For speeds greater than 10 mph*



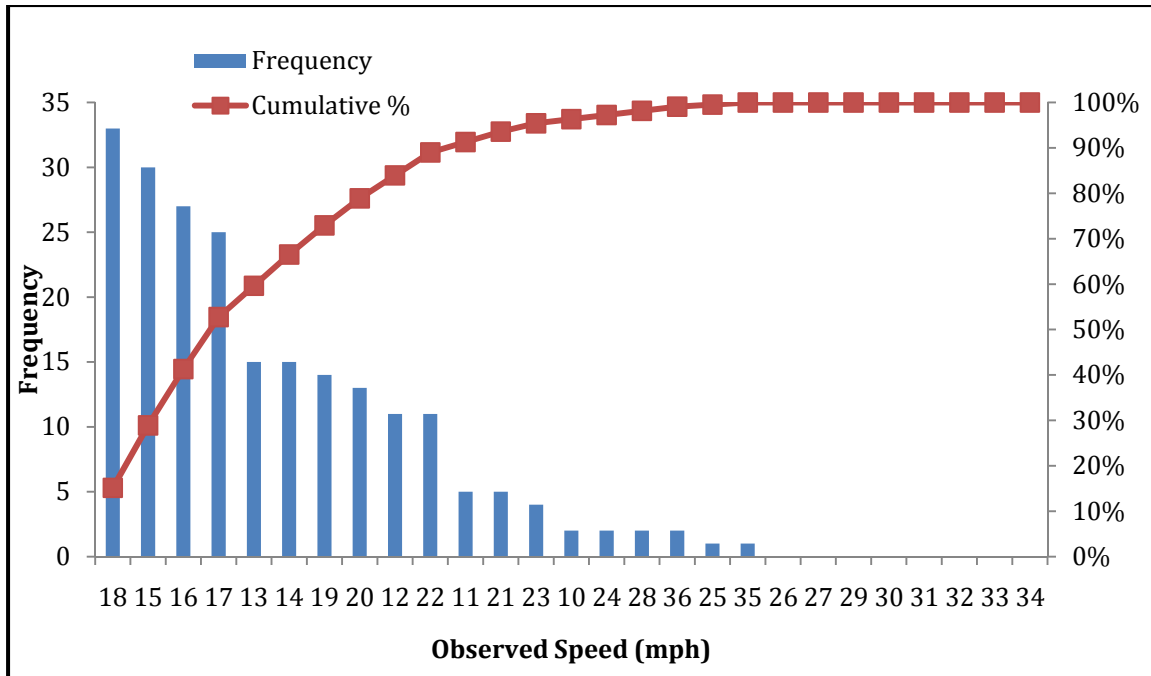


**Figure 9 Aerial Photo of a Supermarket (50 Acres)**  
*03/18/2011 and 03/20/2011*

**Table 14 Speed Distribution on Circulatory Road of a Supermarket (Weekday)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed<br/>Speed mph</i> | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed<br/>Speed mph</i>    | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 2                | 0.9%                | 18                               | 33               | 15%                 |
| 11                            | 5                | 3.2%                | 15                               | 30               | 29%                 |
| 12                            | 11               | 8.3%                | 16                               | 27               | 41%                 |
| 13                            | 15               | 15.1%               | 17                               | 25               | 53%                 |
| 14                            | 15               | 22.0%               | 13                               | 15               | 60%                 |
| 15                            | 30               | 35.8%               | 14                               | 15               | 67%                 |
| 16                            | 27               | 48.2%               | 19                               | 14               | 73%                 |
| 17                            | 25               | 59.6%               | 20                               | 13               | 79%                 |
| 18                            | 33               | 74.8%               | 12                               | 11               | 84%                 |
| 19                            | 14               | 81.2%               | 22                               | 11               | 89%                 |
| 20                            | 13               | 87.2%               | 11                               | 5                | 91%                 |
| 21                            | 5                | 89.4%               | 21                               | 5                | 94%                 |
| 22                            | 11               | 94.5%               | 23                               | 4                | 95%                 |
| 23                            | 4                | 96.3%               | 10                               | 2                | 96%                 |
| 24                            | 2                | 97.2%               | 24                               | 2                | 97%                 |
| 25                            | 1                | 97.7%               | 28                               | 2                | 98%                 |
| 26                            | 0                | 97.7%               | 36                               | 2                | 99%                 |
| 27                            | 0                | 97.7%               | 25                               | 1                | 100%                |
| 28                            | 2                | 98.6%               | 35                               | 1                | 100%                |
| 29                            | 0                | 98.6%               | 26                               | 0                | 100%                |
| 30                            | 0                | 98.6%               | 27                               | 0                | 100%                |
| 31                            | 0                | 98.6%               | 29                               | 0                | 100%                |
| 32                            | 0                | 98.6%               | 30                               | 0                | 100%                |
| 33                            | 0                | 98.6%               | 31                               | 0                | 100%                |
| 34                            | 0                | 98.6%               | 32                               | 0                | 100%                |
| 35                            | 1                | 99.1%               | 33                               | 0                | 100%                |
| 36                            | 2                | 100.0%              | 34                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 10 Histogram of Speed Distribution on Circulatory Road of a Supermarket (Weekday)**

*\*For speeds greater than 10 mph*

**Table 15 Speed Data on Circulatory Road of a Supermarket (Weekday)**

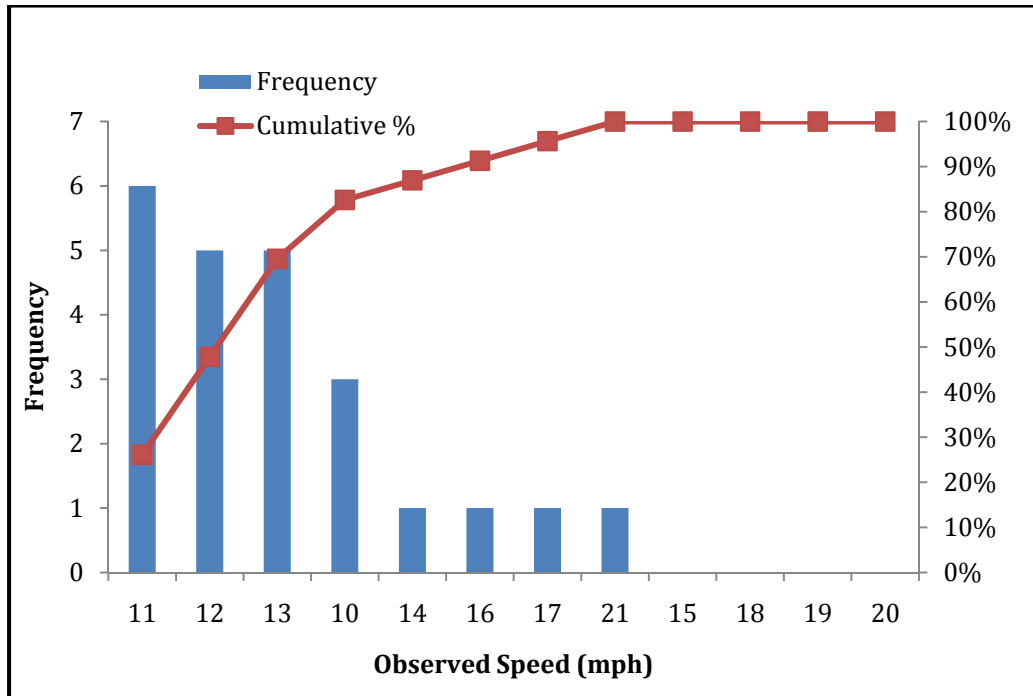
| <b>Statistical Measure</b> | <b>Value</b> |
|----------------------------|--------------|
| Mean                       | 16.9         |
| Standard Error             | 0.2          |
| Median                     | 17           |
| Mode                       | 18           |
| Standard Deviation         | 3.6          |
| Sample Variance            | 13.3         |
| Kurtosis                   | 5.5          |
| Skewness                   | 1.5          |
| Range                      | 26           |
| Minimum                    | 10           |
| Maximum                    | 36           |
| Sum                        | 3678         |
| Count                      | 217          |
| 85th Percentile Speed      | 20 mph       |
| Confidence Level (95.0%)   | 0.5          |

*\*For speeds greater than 10 mph*

**Table 16 Speed Distribution on Aisle of a Supermarket (Weekday)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 3                | 13.0%               | 11                               | 6                | 26%                 |
| 11                            | 6                | 39.1%               | 12                               | 5                | 48%                 |
| 12                            | 5                | 60.9%               | 13                               | 5                | 70%                 |
| 13                            | 5                | 82.6%               | 10                               | 3                | 83%                 |
| 14                            | 1                | 87.0%               | 14                               | 1                | 87%                 |
| 15                            | 0                | 87.0%               | 16                               | 1                | 91%                 |
| 16                            | 1                | 91.3%               | 17                               | 1                | 96%                 |
| 17                            | 1                | 95.7%               | 21                               | 1                | 100%                |
| 18                            | 0                | 95.7%               | 15                               | 0                | 100%                |
| 19                            | 0                | 95.7%               | 18                               | 0                | 100%                |
| 20                            | 0                | 95.7%               | 19                               | 0                | 100%                |
| 21                            | 1                | 100.0%              | 20                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 11 Histogram of Speed Distribution on Aisle of a Supermarket (Weekday)**

*\*For speeds greater than 10 mph*

**Table 17 Speed Data on Aisle of a Supermarket (Weekday)**

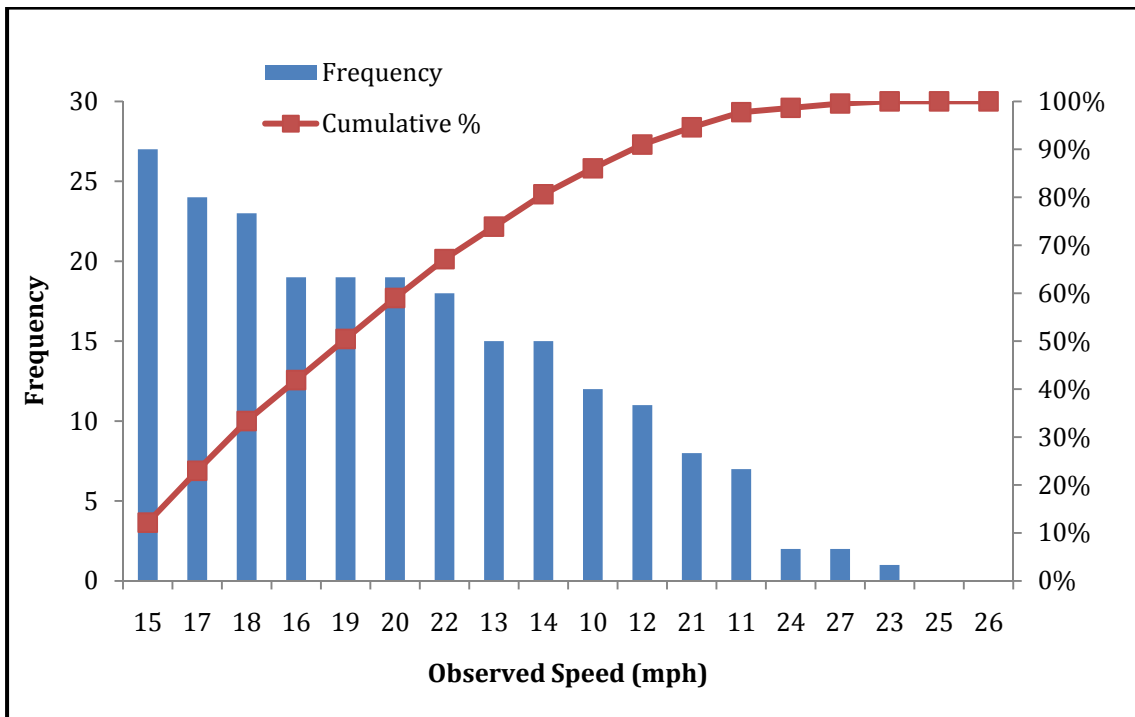
| <b><i>Statistical Measure</i></b> | <b><i>Value</i></b> |
|-----------------------------------|---------------------|
| Mean                              | 12.6                |
| Standard Error                    | 0.5                 |
| Median                            | 12                  |
| Mode                              | 11                  |
| Standard Deviation                | 2.5                 |
| Sample Variance                   | 6.4                 |
| Kurtosis                          | 4.8                 |
| Skewness                          | 2.0                 |
| Range                             | 11                  |
| Minimum                           | 10                  |
| Maximum                           | 21                  |
| Sum                               | 289                 |
| Count                             | 22                  |
| 85th Percentile Speed             | 14 mph              |
| Confidence Level (95.0%)          | 1.10                |

*\*For speeds greater than 10 mph*

**Table 18 Speed Distribution on Circulatory Road of a Supermarket (Weekend)**

| Data by Increasing mph |           |              | Data by Most Frequent mph |           |              |
|------------------------|-----------|--------------|---------------------------|-----------|--------------|
| Observed Speed mph     | Frequency | Cumulative % | Observed Speed mph        | Frequency | Cumulative % |
| 10                     | 12        | 5.4%         | 15                        | 27        | 12%          |
| 11                     | 7         | 8.6%         | 17                        | 24        | 23%          |
| 12                     | 11        | 13.5%        | 18                        | 23        | 33%          |
| 13                     | 15        | 20.3%        | 16                        | 19        | 42%          |
| 14                     | 15        | 27.0%        | 19                        | 19        | 50%          |
| 15                     | 27        | 39.2%        | 20                        | 19        | 59%          |
| 16                     | 19        | 47.7%        | 22                        | 18        | 67%          |
| 17                     | 24        | 58.6%        | 13                        | 15        | 74%          |
| 18                     | 23        | 68.9%        | 14                        | 15        | 81%          |
| 19                     | 19        | 77.5%        | 10                        | 12        | 86%          |
| 20                     | 19        | 86.0%        | 12                        | 11        | 91%          |
| 21                     | 8         | 89.6%        | 21                        | 8         | 95%          |
| 22                     | 18        | 97.7%        | 11                        | 7         | 98%          |
| 23                     | 1         | 98.2%        | 24                        | 2         | 99%          |
| 24                     | 2         | 99.1%        | 27                        | 2         | 100%         |
| 25                     | 0         | 99.1%        | 23                        | 1         | 100%         |
| 26                     | 0         | 99.1%        | 25                        | 0         | 100%         |
| 27                     | 2         | 100.0%       | 26                        | 0         | 100%         |

*\*For speeds greater than 10 mph*



**Figure 12 Histogram of Speed Distribution on Circulatory Road of a Supermarket (Weekend)**

*\*For speeds greater than 10 mph*

**Table 19 Speed Data on Circulatory Road of a Supermarket (Weekend)**

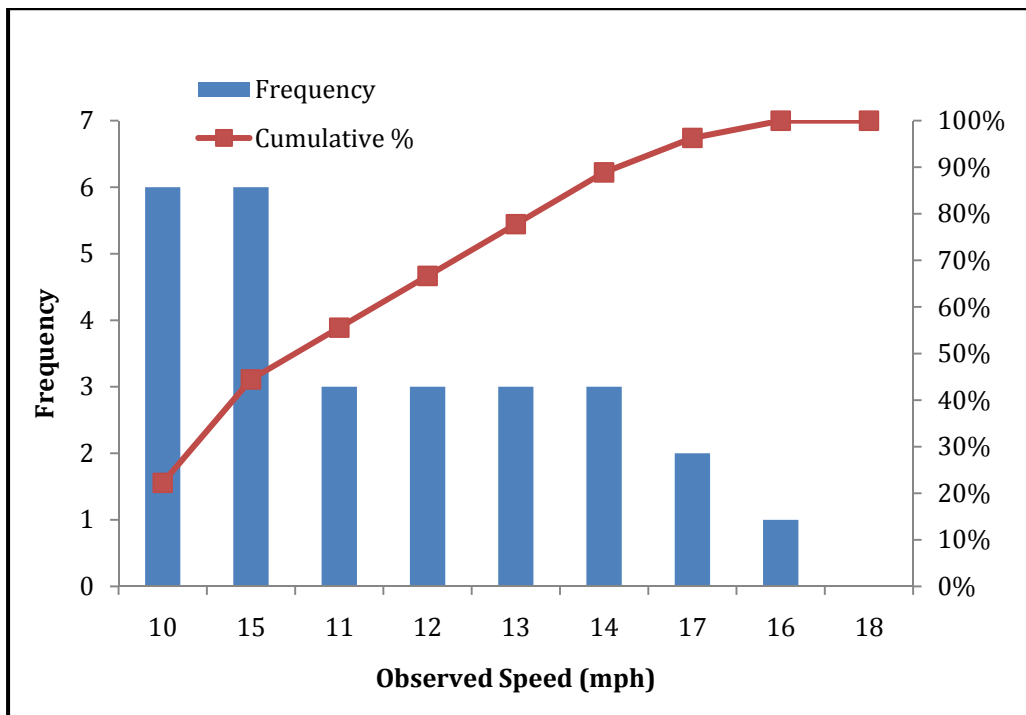
| <b>Statistical Measure</b> | <b>Value</b> |
|----------------------------|--------------|
| Mean                       | 16.6         |
| Standard Error             | 0.2          |
| Median                     | 17           |
| Mode                       | 15           |
| Standard Deviation         | 3.5          |
| Sample Variance            | 12.5         |
| Kurtosis                   | -0.4         |
| Skewness                   | 0.1          |
| Range                      | 17           |
| Minimum                    | 10           |
| Maximum                    | 27           |
| Sum                        | 3695         |
| Count                      | 222          |
| 85th Percentile Speed      | 20 mph       |
| Confidence Level (95.0%)   | 0.47         |

*\*For speeds greater than 10 mph*

**Table 20 Speed Distribution on Aisle of a Supermarket (Weekend)**

| <i>Data by Increasing mph</i> |                  |                     | <i>Data by Most Frequent mph</i> |                  |                     |
|-------------------------------|------------------|---------------------|----------------------------------|------------------|---------------------|
| <i>Observed Speed mph</i>     | <i>Frequency</i> | <i>Cumulative %</i> | <i>Observed Speed mph</i>        | <i>Frequency</i> | <i>Cumulative %</i> |
| 10                            | 6                | 22%                 | 10                               | 6                | 22%                 |
| 11                            | 3                | 33%                 | 15                               | 6                | 44%                 |
| 12                            | 3                | 44%                 | 11                               | 3                | 56%                 |
| 13                            | 3                | 56%                 | 12                               | 3                | 67%                 |
| 14                            | 3                | 67%                 | 13                               | 3                | 78%                 |
| 15                            | 6                | 89%                 | 14                               | 3                | 89%                 |
| 16                            | 1                | 93%                 | 17                               | 2                | 96%                 |
| 17                            | 2                | 100%                | 16                               | 1                | 100%                |
| 18                            | 0                | 100%                | 18                               | 0                | 100%                |

*\*For speeds greater than 10 mph*



**Figure 13 Histogram of Speed Distribution on Aisle of a Supermarket (Weekend)**

*\*For speeds greater than 10 mph*



**Table 21 Speed Data on Aisle of a Supermarket (Weekend)**

| <i>Statistical Measure</i> | <i>Value</i> |
|----------------------------|--------------|
| Mean                       | 13.0         |
| Standard Error             | 0.4          |
| Median                     | 13           |
| Mode                       | 15           |
| Standard Deviation         | 2.3          |
| Sample Variance            | 5.3          |
| Kurtosis                   | -1.2         |
| Skewness                   | 0.1          |
| Range                      | 7            |
| Minimum                    | 10           |
| Maximum                    | 17           |
| Sum                        | 350          |
| Count                      | 27           |
| 85th Percentile Speed      | 15 mph       |
| Confidence Level (95.0%)   | 0.91         |

*\*For speeds greater than 10 mph*