

## Water Heater Failures



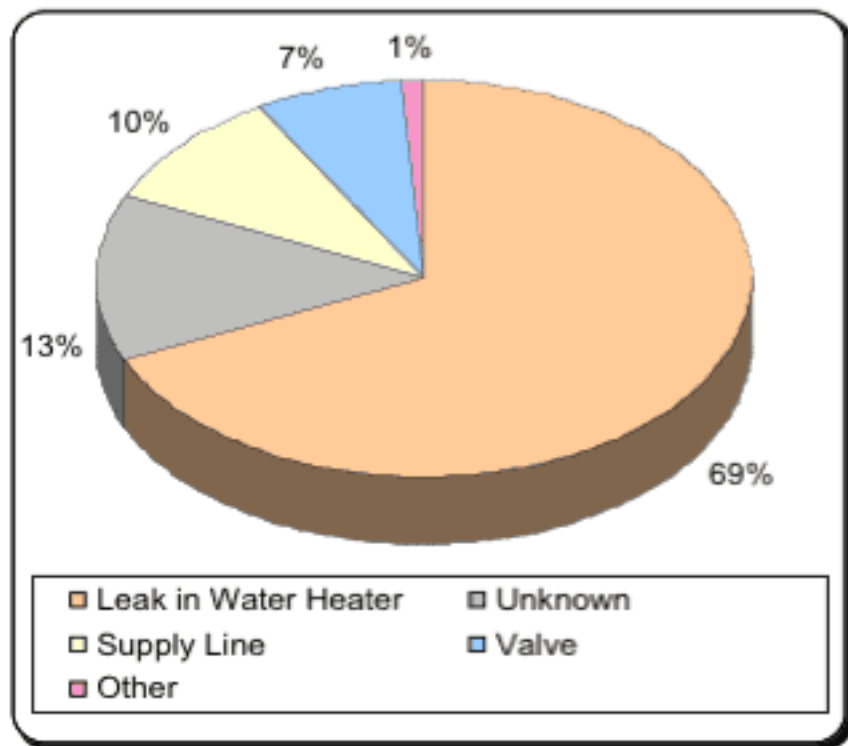
### Water Heater Failure Facts:

A review of homeowner's insurance claims resulting from water heater failures from multiple insurance companies around the country revealed:

- Water heater failures are one of the top five sources of residential water losses.
- 69% of all water heater failures result from a slow leak or a sudden burst.
- Water heater failures cost an average of \$4,444 per incident after the deductible was paid.
- Supply line failure was the cause in only 10% of claims, but these claims typically were 60% higher than those caused by leaking or bursting.
- The age at which a water heater tank failed due to leaking or bursting was available for 32% of the claims. Water heaters up to 20 years old accounted for 95% of these claims.
- Failures of water heaters located on the first floor resulted in 33% greater losses than those resulting from water heaters in basements.
- Approximately 9% of all water heater failures occurred in unoccupied homes and resulted in 49% higher claims.

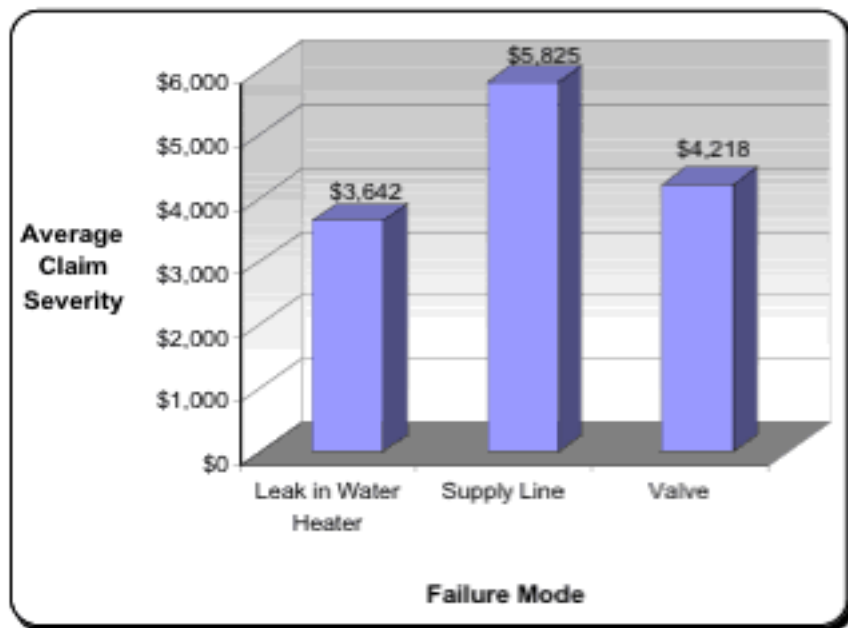
### Water Heater Failure Mode Claim Frequency and Severity:

In a review of 700 water heater claims, nearly seven of 10 failures were due to a tank bursting or leaking. (See Figure 1) The exact failure mode for 13% of water heater claims in this study could not be determined based on the information provided. It is likely, however, that many of these failures are also the result of a tank that has burst or leaked.



**Figure 1: Water Heater Failure Mode Claim Frequency**

The cost of a water heater claim varies greatly depending on the failure mode. (See Figure 2) In this study, supply line failures averaged 60% greater losses relative to leaking or burst tanks.



**Figure 2: Water Heater Failure Mode Claim Severity**

This is also illustrated by comparing the interquartile range for the three main water heater failure modes:

leaks, supply lines and valves. (See Table 1)

Loss Source	Lower Quartile	Upper Quartile
Leak/Burst	\$1,159	\$4,634
Supply Line	\$1,719	\$7,632
Valve	\$1,086	\$5,439

**Table 1: Interquartile Range of Claim Payments by Water Heater Failure Mode**

There was a significant difference between these three failure modes. Specifically, the average cost of a water heater leak or burst claim was 60% less than a water heater supply line failure. There were no statistically significant differences in the cost of a valve failure when compared to the other two failure modes.

## Water Heater Rate of Failure

Most water heater failures occur when the water heater has reached its life expectancy and the tank begins to rust and corrode. This is true since the majority of water heater failures involve leaking or bursting, usually as the result of a deteriorated tank.

The age at which a tank leaked or burst could be determined for 32% of the claims. The ages at failure, which resulted in a claim, ranged from less than a year to more than 30 years. The average age was 10.7 years. (See Figure 3)

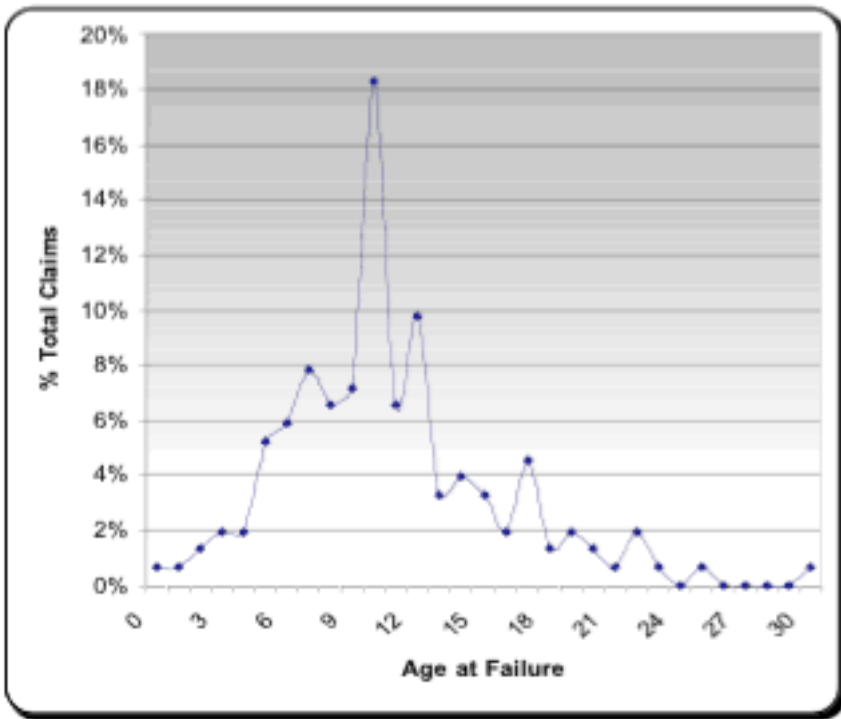
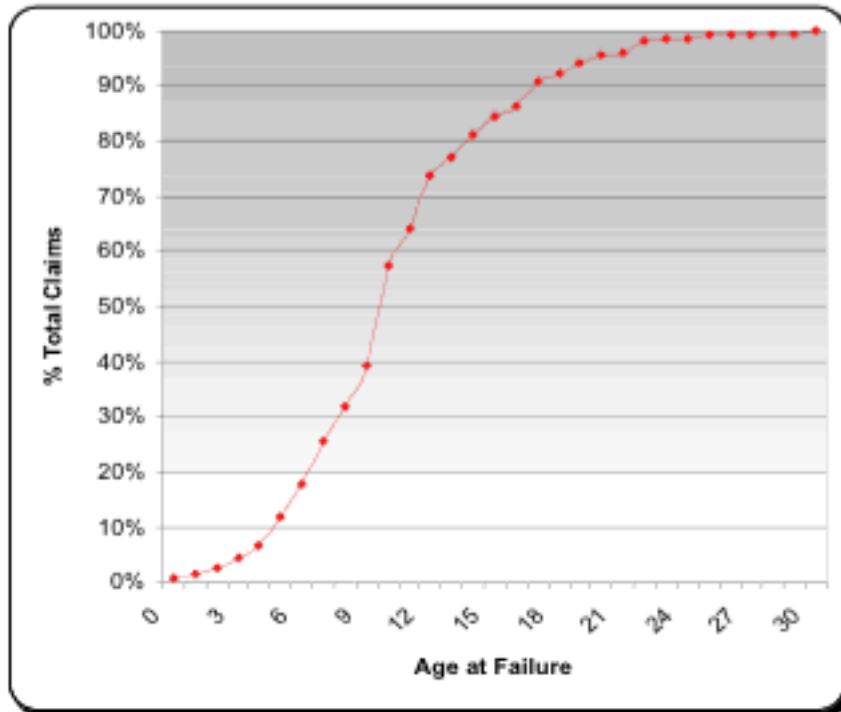


Figure 3: Cumulative Distribution of Water Heater Leaks/Bursts by Age at Failure

### Age at Failure

The rate of failure resulting in a claim begins to dramatically increase for a water heater beginning at age 5 – when 12% of all failures occurred. By the time a water heater reaches age 12, nearly three quarters of have



failed. (See Figure 4)

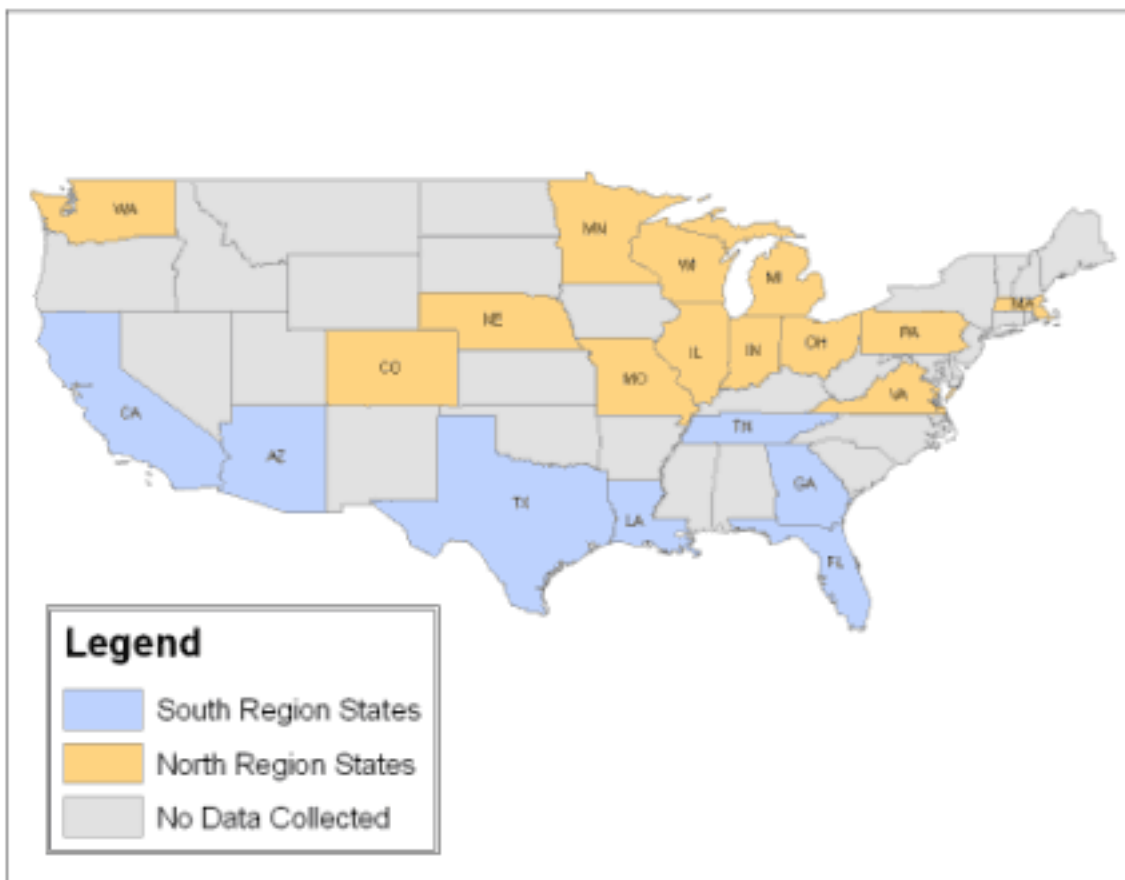
Figure 4: Water Heater Leaks/Bursts by Age at Failure

One factor that may influence the life expectancy of a water heater is the limited tank and parts warranty provided by the manufacturer. Typical water heater warranties can range from three to 12 years. It is expected that there is a correlation between the life expectancy of a water heater and the warranty limitation, but no information was available about the length of the warranty of the water heater tanks that failed.

This assessment was based on the claims data provided. The total number and age of water heaters in the insured portfolio was not known. Data regarding water heater replacements that resulted in a claim also was not provided.

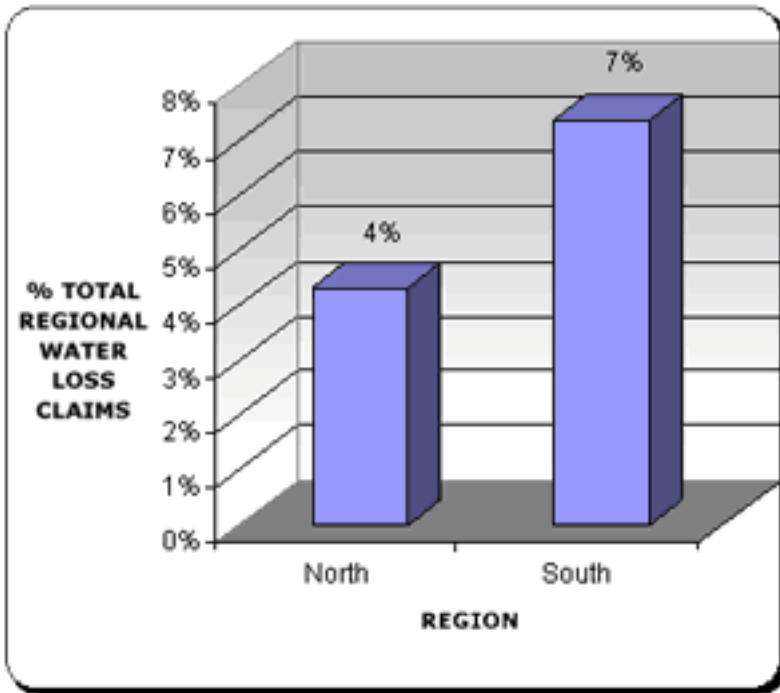
## Water Heater Failures by Region:

Homes that incurred water heater claims were separated into two regions: North Region states and South Region states. (See Figure 5) Each region contains claim data from a minimum of three of the five contributing insurance companies. Of the claims reviewed in the study, 60% were from the North Region states and 40% were from the South Region states.



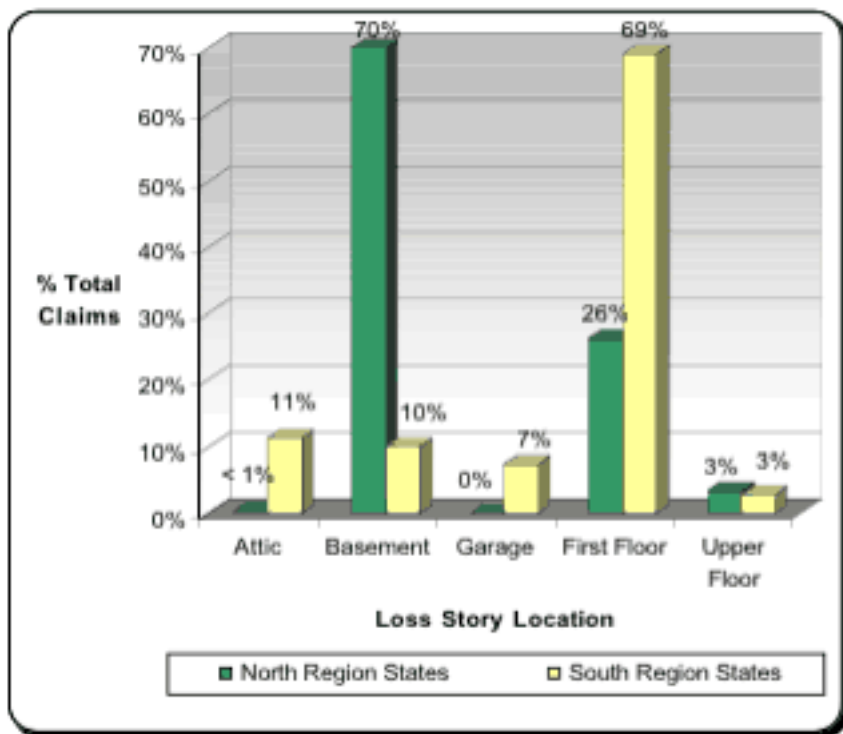
**Figure 5: Claim Region Map**

The percentage of water heater claims relative to the total number of water loss claims in each region was compared. Home in the South were nearly twice as likely (7%) to suffer a water heater failure that resulted in a claim. (See Figure 6) This likely is because of the location of the water heater on the first floor within reach of high-dollar items such as furniture. The five primary locations for water heaters in both regions include the garage, attic, basement, first floor and an upper-level floor.



**Figure 6: Percentage Water Loss Claims by Region**

In the South Region, 69% of all water heaters that failed and resulted in a claim were located on the home's first floor, likely within reach of high-dollars items such as furniture. (See Figure 7)



**Figure 7: Water Heater Claim Distribution by Loss Story Location**

Additionally, 11% of all water heaters in the South Region were located in an attic space compared to less than 1% in the North Region. Progressive damage is less likely to be observed when a water heater is concealed.

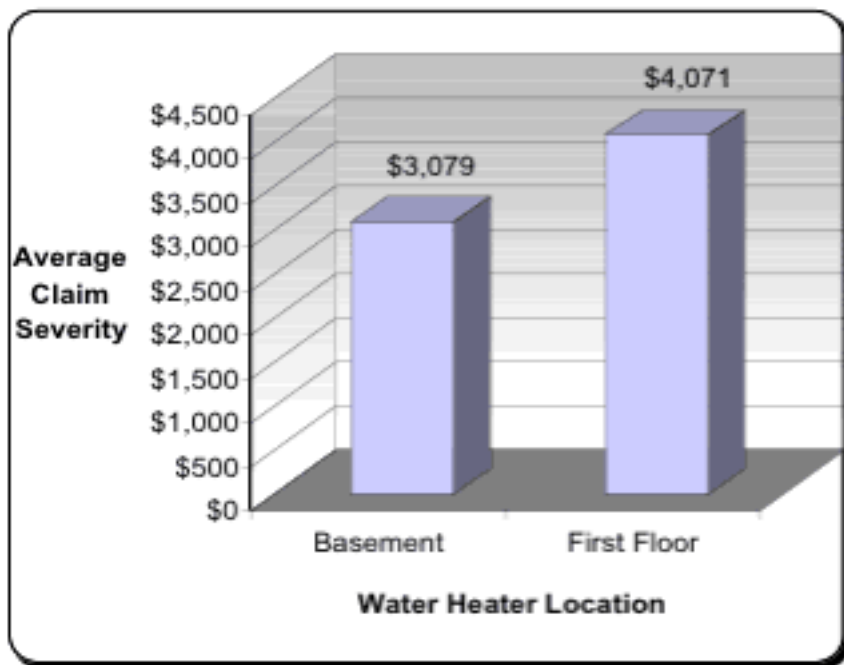
As for the North Region, 70% of failures resulting in a claim involved a water heater located in the basement, which are uncommon in the South. Water heaters installed on the first floor of a home in the North Region accounted for just 26% of all claims.

The failure of water heaters located in the basement is much less likely to result in a claim. Many basements have concrete floors and are used for storage purposes only. Failures that occur in this type of a basement may never result in a claim, especially if the damage is less than the policy deductible. Also, many basements contain floor drains and sump pumps that assist in removing water before permanent damage occurs.

A complete analysis of the frequency of water heater claims by location was not done. The claims information did not list the total distribution of water heaters by location for the two regions.

The severity of a water heater-related claim was analyzed to determine if differences existed based on location. (See Figure 8) There were an insufficient number of claims for garages, attics or upper-level floors, so these locations were excluded from the analysis.

Results revealed that first-floor water heater claims cost 32% more than those that occurred in the basement.



**Figure 8: Water Heater Severity by Loss Story Location**

## Reducing Water Heater Failure Risk

This study revealed water heaters fail most often when the water heater tank develops a slow leak or suddenly bursts. This will occur once the water heater has reached its life expectancy.

Proper maintenance, including inspecting the water heater's anode rod and flushing sediment from the tank, can delay the need to replace a water heater.

A typical water heater storage tank is constructed of steel and contains an internal glass lining to protect the storage tank from corrosion. According to leading water heater manufacturers, such as Bradford White and A. O. Smith, the glass lining often has imperfections that develop during manufacturing or while handling the water heater during installation. These imperfections allow water to penetrate the glass lining and eventually lead to corrosion of the storage tank. If the corrosion persists, the water heater will begin to leak and eventually burst.

Water heater manufacturers install a "sacrificial" anode rod to deter corrosion of the steel tank. This rod is usually made of aluminum, magnesium, or zinc and its purpose is to attract any corrosion that may occur. Once this rod has corroded, it can no longer protect the steel tank.

To combat this, homeowners should have a plumbing professional inspect the anode rod. Manufacturers' recommendations vary regarding anode inspection time lines. Conservatively, the anode rod should be inspected once every two years and at least annually once the warranty has expired. Acidic water or the use of a water softener can accelerate the corrosion of the anode rod, according to Bradford White, so homeowners are advised to more frequently inspect the anode rod under these conditions.

If the rod shows significant signs of corrosion, for example if half of the original rod diameter is depleted or wire

is exposed, replace the rod immediately. Replacing the worn anode rod will allow the new rod to continue to draw corrosion away from the tank and will add years to the life expectancy of the water heater.

Preventive water heater maintenance should also include removing sediment by flushing the tank every six months. Sediment will build up faster in areas with hard water.

As the layer of sediment thickens, it can act as a barrier to the function of the anode rod. In gas water heaters, it can also cause the water heater flame to work harder to heat the water, resulting in early deterioration and deformity at the base of the water heater. Water heaters can be flushed by attaching a garden hose to the valve at the base of the water heater. This will drain the tank and allow the sediment to wash away.

The shut-off valve and all piping should be thoroughly examined by a plumbing professional annually. The plumbing professional should look for signs of failing plumbing, such as loose or wet joints and rust. All valves should be operated to ensure they open and close properly. Inoperable valves should be replaced immediately. It is recommended that ball valves are used in place of gate valves whenever possible.

## **Important notes about this claim study:**

- 1) This study includes the analysis of 700 water heater claims from a sample of 12,404 closed water claims. These claims occurred in 20 different states from five insurance companies
- 2) Where analyses were conducted on the severity of water heater claims, only 11,377 closed claims and 637 water heater claims were considered. The remaining claims were removed from the sample because of obvious upper and lower claim payment limits.
- 3) All claim severity analyses excluded any claim payment values that were more than three standard deviations greater than the average claim payment. These claims were termed "outliers."
- 4) All statements in this study related to average claim payments have been tested for significance using a one-way ANOVA and Levene's test for homogeneity of variance. Where homogeneity of variance was not met, Brown-Forsythe and Welch statistics were used to validate the significance.
- 5) Where equal variances were assumed, Scheffe's Post Hoc test was used to determine underlying variances between specific groups of claims. Where equal variances were not assumed, the Games-Howell Post Hoc test was used.