WELCOME TO
LAKE MEAD
NATIONAL
RECREATION AREA
EPIDEMIOLOGY of RECREATIONAL FATALITIES at LAKE MEAD NATIONAL RECREATION AREA: A FIVE YEAR ANALYSIS
RESEARCH QUESTIONS

1. Which visitors (based on gender, age group) are more likely to be injured at Lake Mead National Recreation Area (LMNRA)?

2. What are the prevalence rates of visitors’ fatalities?

3. What are the leading causes of fatalities at LMNRA?

4. What times (months/days/time of day) are fatalities more commonly occurring?

5. To what degree are weather-related conditions, consumption of alcohol, and lack of wearing a personal floating device (PFD), a factor in reported fatalities?

6. Are fatalities clustered at specific locations at LMNRA?
Significance of the Study:

- Effectively target injury prevention efforts
- Provide a science-based approach to understanding the cause of visitor’s injuries and fatalities at LMNRA during the last five years.
THEORETICAL FRAMEWORKS

This study was guided by the following theories:

- Heinrich’s Domino Theory
- Human Factors Theory
Data Sources and Collection:

- Cross-sectional (descriptive) data from Incident Reports
- January 1, 2010 to December 31, 2010
- Visitor Injury Data system (VIDS)

Classifications within VIDS are based on definitions used by the Centers for Disease Control and Prevention’s web-based Injury Statistics Query and Reporting System (WISQUARS).
The Data Collected Were Based On:

- date of incident
- time of injury
- wind speed
- air temperature
- gender and age
- race/ethnicity
- place of residence
- pre-death activity
- cause of fatality,
- area of park
- primary contributing factor of each incident
DATA ANALYSIS

Statistical Package for the Social Sciences-SPSS (Version 18 for Windows™)

Pearson product-moment coefficients and Davis’ (1971) conventions

Effect sizes were computed using Cohen’s (1988) d coefficients and indices
RESULTS

Demographics of Victims:

- **Male**: 84%
- **Mean age of Victim**: 43 years
  (SD=20.98; range=3-91 years)
- **Race/Ethnicity**:
  - White, Non-Hispanic (67%)
  - Hispanic (27%)
  - Other (6%)
Figure 1. Causes of Fatalities by Age Group
Prevalence of Fatalities:

- A rate of 2.3 fatalities per million visitors in 2007 [Number of Visitors = 7,622,139]
- A rate of 4.3 fatalities per million visitors in 2010 [Number of Visitors = 7,080,758]
Figure 2. Reported Fatalities by Year

Bar Chart

Year of Incident
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010

Count

Number of Fatalities

Unintentional Injury
Suicide
Unknown
Leading Causes of Fatalities:

- Drowning incidents (35%)
- Natural Causes (19%)
- Transportation related activities (15%)
Distribution of Fatalities Based on Months, Days, Time of Day:

- Peaked during the month of *August*
- Lowest in *December*
- Most common on *Saturday, Sunday, & Thursday*
- Most (48%) fatalities occurred between *Noon and 6:00 PM*
Figure 3. Monthly Distribution of Fatalities (2005-2010)
Figure 4. Distribution of Fatalities by Day of Week (2005-2010)
Figure 5. Distribution of Fatalities by Day of Week (2005-2010)
Usage of PFDs:

In 2009, water-based victims (over 15%) were less likely to use a PFD.

### Table 1

Use of Life Jacket (PFD) by Year of Incident

<table>
<thead>
<tr>
<th>Year of Incident</th>
<th>No</th>
<th>Yes</th>
<th>Not Applicable</th>
<th>Unknown</th>
<th>Total</th>
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<tr>
<td>2005</td>
<td>6</td>
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<td>17</td>
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<td>25</td>
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<tr>
<td>2007</td>
<td>5</td>
<td>3</td>
<td>11</td>
<td>1</td>
<td>20</td>
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<tr>
<td>2008</td>
<td>7</td>
<td>3</td>
<td>14</td>
<td>0</td>
<td>24</td>
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</tr>
<tr>
<td>2010</td>
<td>8</td>
<td>0</td>
<td>24</td>
<td>1</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>46</td>
<td>18</td>
<td>92</td>
<td>2</td>
<td>158</td>
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</table>
Relationships among Selected Variables and Causes of Fatalities:

- Four variables (age group, alcohol use, usage of PFDs, air temperature) accounted for a significant relationship with causes of fatalities.
- Prevalence of alcohol use was LOW ($r=0.22$, $p<0.01$).
- Alcohol use was highest within the 25-44 age group.
- PFD ($r=0.74$, $p<0.01$) [strong positive correlation]
### Table 2:

**Bivariate Correlations of Selected Variables of Interest with Causes of Visitors’ Fatalities**

<table>
<thead>
<tr>
<th></th>
<th>Age Group</th>
<th>Causes of Visitors’ Fatalities</th>
<th>Alcohol Use</th>
<th>Usage Rate of PFD</th>
<th>Air Temp</th>
<th>Wind Speed</th>
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</thead>
<tbody>
<tr>
<td><strong>Age Group</strong></td>
<td>Pearson Correlation</td>
<td>1</td>
<td>.356**</td>
<td>.228**</td>
<td>.414**</td>
<td>-.228**</td>
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<tr>
<td>Sig. (2-tailed)</td>
<td>.000</td>
<td>.004</td>
<td>.000</td>
<td>.004</td>
<td>.007</td>
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<tr>
<td>N</td>
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<td>158</td>
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<td>158</td>
<td>158</td>
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<tr>
<td><strong>Causes of Visitor Fatalities</strong></td>
<td>Pearson Correlation</td>
<td>.356**</td>
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<td>.294**</td>
<td>.740**</td>
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<tr>
<td>Sig. (2-tailed)</td>
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<td>.000</td>
<td>.010</td>
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<tr>
<td><strong>Alcohol Use</strong></td>
<td>Pearson Correlation</td>
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<td>.294**</td>
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<td>.289**</td>
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<tr>
<td>Sig. (2-tailed)</td>
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<td>.000</td>
<td>.006</td>
<td>.095</td>
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<tr>
<td><strong>Usage Rate of PFD</strong></td>
<td>Pearson Correlation</td>
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<td>.740**</td>
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</tr>
<tr>
<td><strong>Air Temp</strong></td>
<td>Pearson Correlation</td>
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<td>-.205**</td>
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<td>Sig. (2-tailed)</td>
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<td>.010</td>
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</tr>
<tr>
<td><strong>Wind Speed</strong></td>
<td>Pearson Correlation</td>
<td>-.213**</td>
<td>-.122</td>
<td>-.133</td>
<td>-.147</td>
<td>.126</td>
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<tr>
<td>Sig. (2-tailed)</td>
<td>.007</td>
<td>.128</td>
<td>.095</td>
<td>.065</td>
<td>.116</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>158</td>
<td>158</td>
<td>158</td>
<td>158</td>
<td>158</td>
<td>158</td>
</tr>
</tbody>
</table>

**. Correlation is significant at the 0.01 level (2-tailed).**
Table 2: Practical Significance of Selected Variables of Interest

<table>
<thead>
<tr>
<th>VARIABLE</th>
<th>EFFECT SIZE</th>
<th>COHEN’S INDEX</th>
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<tbody>
<tr>
<td>PFD</td>
<td>.54</td>
<td>LARGE</td>
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<tr>
<td>AGE GROUP</td>
<td>.13</td>
<td>SMALL</td>
</tr>
<tr>
<td>USE OF ALCOHOL</td>
<td>.08</td>
<td>NEGLIGIBLY SMALL</td>
</tr>
</tbody>
</table>
TOP FIVE LOCATIONS OF INCIDENTS BY GIS:

1. Overton Beach
2. Echo Bay
3. Calville Bay
4. Lake Mead Marina
5. Hemmenway Harbor
6. Temple Bar
7. South Cove
8. Willow Beach
TOP 5 LOCATIONS OF INCIDENTS BY GIS:

#1 Boulder Beach
http://www.riverlakes.com/boulder_beach_campground.htm

#2 Callville Bay
http://callvillebay.com/

http://www.riverlakes.com/boulder_beach_campground.htm
http://callvillebay.com/
TOP 5 LOCATIONS OF INCIDENTS BY GIS:

#3 Six Mile Cove

TOP 5 LOCATIONS OF INCIDENTS BY GIS:

#4 Government Wash


#5 Las Vegas Wash

http://en.wikipedia.org/wiki/Las_Vegas_Wash 2005
Katherine’s Landing accounted for 40% of fatalities attributed to natural causes.
CONCLUSIONS

- Results of this study support public policies aimed at increasing the use of PFDs as well as reducing alcohol consumption (O’Conner & O’Conner, 2005; McCarthy & Talley, 2001).

- The results of this study indicate that human factors contributed to most of the fatalities.
The typical victim of a water-based fatality was more likely to be an adult male within the 25-44 age category.

Natural causes and transportation-related victims were more likely to be male visitors in the 45 and older age category.
Victim’s characteristics, pre-existing health conditions, activities, and selected locations of fatalities vary in discernible patterns with age.
Based on the findings of this study, Lake Mead has the opportunity to develop specific strategies that will minimize the incidence of accidents and the severity of injuries.
This proposed solution can be accomplished by developing a risk management plan for visitors.
Having access to data indicating times, months, and days when most fatalities occur; may assist park personnel to develop selected schedule patterns to reduce fatalities.
Collaboration with a cadre of professionals to address:

- ...prevalence of natural causes,
- ...water-based incidents, &
- ...motor vehicle accidents affecting high risk groups.
Collecting data for a 10-year period (2000-2010) may reveal more robust results in predicting fatalities when compared to the current 5-year data.
National Park Service
U.S. Department of the Interior

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