

## **Athletic Success and Aridity: Do College Football Teams From Arid States Posses an Advantage due to Climate or Other Reasons?**

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Abstract:

*Abstract: The author examines college football data from 2000-2005 to determine whether there is a larger "home field advantage" for universities located in arid/semi arid states. In order to differentiate for obvious advantages in skill amongst teams point spread data is studied. The author will attempt to determine whether there are distinct disadvantages teams traveling from humid states face when they must travel to an arid state or if teams traveling from arid states face a disadvantage when they travel to humid/semi humid states.*

*If there is a distinct difference in "arid team" performance against universities from humid states as opposed to universities from other arid states it can at least be determined that this factor is not accounted for by the betting public. While point spread data is imperfect, it is the author's contention that if this relationship exists it points to a real difficulty in overcoming this climate change for teams from either arid or humid states.*

*Key Words: Athletics, Probability, Climate, Home Field Advantage*

**Introduction:** The primary motivation of this paper is to show a significant (or lack of a significant) relationship between the arid/semi arid states teams overall performance against the spread

as opposed to when they were at home playing a team from a humid/semi humid state (against the spread) and also when they are on the road playing a team from a humid/semi humid state (against the spread). Point spread data was used because the betting public ostensibly considers home field advantage and a team's ability when wagering on how a team will perform. A secondary issue is to determine whether teams from arid/semi arid states tend to be more or less successful than teams from humid/semi humid states in college football.

### **Arid Teams Success at College**

**Football:** For the period from 2000 through 2005 the thirty-one teams located in arid/semi arid states won 1079 of the 2145 games that they played for a winning percentage of 50.30%. The eighty-four teams located in humid/semi humid states won 3004 out of 5780 games played for a winning percentage of 51.97%<sup>1</sup>. This includes games against non division 1-A opponents which explains the winning percentages being above 50% for both cohorts.

It is not surprising that teams from humid states have been more successful in college football than teams from arid states. There are considered to be six "power conferences" in college football (Atlantic Coast, Big East, Big Ten, Big Twelve, Pacific Ten, Southeastern). Out of the thirty-one arid teams only twelve of those teams are located in a power conference (ten of these teams are in the Big Twelve and two in the Pacific Ten). Out of the eighty-four humid teams fifty-four of these teams are either Notre

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<sup>1</sup> Four teams in humid states started playing 1-A football after the year 2000 and are not included in the sample.

Dame or are located in a power conference Texas (in 2005) and Oklahoma (in 2000) are the only teams from an arid state to win the BCS Championship during the period studied. Since 1946 only one team (excluding Notre Dame) not from a power conference has won a national championship in college football (Brigham Young in 1984).

### **Arid Teams Success at College**

**Football against the Spread:** In order to account for differences in talent point spread data was studied. Point spread bettors are expected to take a team's relative talent and home field advantage into account when placing a wager. If a team won a game by more than it was favored or lost a game by less than it was an underdog it was counted as a win in this point spread data. All "pushes" were not counted and games against 1AA opponents were also not counted.

Teams from humid states were moderately more successful against the spread than teams from arid states. Teams from humid states "won" 50.54% of the games they played against the spread. Teams from arid states "won" 48.75% of the games they played against the spread

### **The Significance of Home Field Advantage when Arid and Humid**

**Teams Compete:** In athletics "home field advantage" is clearly significant. It is generally accepted that a team playing at home is given a three point bonus when the point spread is determined. Let us suppose that Team A plays Team B at a neutral site. Team A is favored by two points because it is considered slightly better than Team B. If these two teams were playing at Team A's home

we would expect Team A to be favored by five points and if they were playing at Team B's home we would expect Team B to be favored by 1 point. Obviously there are teams that might have a larger perceived "home field advantage" than others but this is considered to be generally true when accounting for differences in point spreads.

I was hoping to show a significant (or lack of a significant) relationship between the arid states teams overall performance against the spread as opposed to when they were at home playing a team from a humid state (against the spread) and also when they are on the road playing a team from a humid state (against the spread). If a significant relationship exists we can conclude that aridity is an overlooked factor in determining success for college football teams.

There are many reasons to suspect aridity may play a role in determining the outcome of a highly intense physical contest such as a college football game. Most games played between teams from arid/semi arid states and humid/semi humid states will take place early in the season (August and September) when the differences in climate and aridity will be most severe. It may be very difficult for a team from an arid/semi arid state to adjust to the tremendous differences in humidity and temperature that occur when they travel to a humid/semi humid state. It is possible that individuals will experience significant fatigue and cramping when forced to deal with significant humidity they are not accustomed to. Also it may be difficult to keep players fully hydrated when a team visits an arid/semi arid state from a humid/semi humid state.

**Methodology and Results:** To test whether arid state team ATS performance is different when at home playing a humid state team, I partition the population of arid state team games into two sets. The first set consists of arid state team home games against humid state teams. The second consists of all other arid state team games. In the sample set, arid state teams performed better (ATS) when playing at home against humid state teams. Their ATS winning percentage in such contests was 51.01%. In all other arid state team games, the ATS winning percentage for arid state teams was 48.21%. Employing a z-test for difference in proportions, this difference is not significant at the 5% level. The p-value associated with this difference is 0.1587. The value of the z statistic is 1.000 which is a smaller absolute value than the critical value of 1.645 (See Table One for details).

To test whether arid state team ATS performance is different when away playing a humid state team, I partition the population of arid state team games into two sets. The first set consists of arid state team away games against humid state teams. The second consists of all other arid state team games. In the sample set, arid state teams performed worse (ATS) when playing away against humid state teams. Their ATS winning percentage in such contests was 43.85%. In all other arid state team games, the ATS winning percentage for arid state teams was 49.91%. Employing a z-test for difference in proportions, this difference is significant at the 5% level. The p-value associated with this difference is 0.0158 and the absolute value of the z statistic of 2.155 is greater

than the critical value of 1.645 (see Table One for details).<sup>2</sup> It does appear that teams traveling from an arid state to a humid state face a more significant disadvantage than the general betting public believes.<sup>3</sup>

**Table One:**

Year		N		
Total	0.487543	2047	z	p-value
P1	0.510101	396	1.000008	0.1587
P2	0.482132	1651	z	p-value
P3	0.438462	390	-2.15531	0.0158
P4	0.499095	1657		

Where P1 = ATS win proportion for arid state teams at home against humid state teams,

P2 = ATS win proportion for arid state teams for all games not in sample 1,

P3 = ATS win proportion for arid state teams away against humid state teams,

P4 = ATS win proportion for arid state teams for all games not in sample 3.

**Data about Individual Teams:** While some college football teams are significantly more successful than others there are very few outliers when studying data against the spread from the year 2000-2005. This indicates that the betting public is aware when a team consistently is covering or not covering

<sup>2</sup> For a complete breakdown of how each Division One team performed from 2000-2005 please contact the author at [dkuester@ksu.edu](mailto:dkuester@ksu.edu). I have only included summary data in this paper.

<sup>3</sup> If a bettor wagered on every game involving humid teams hosting arid teams from 2000-2005 on the humid/semi humid team they would have earned over a seven percent return on investment even accounting for the ten percent premium paid on losing bets.

the spread and adjusts accordingly. There are teams that the betting public consistently undervalued during this time period. Boise State (42-23 ATS), Iowa (45-21 ATS), Louisville (42-25 ATS) and Southern Mississippi (40-27 ATS) were very successful against the spread during this period and were at or above .500 ATS every year. Indiana was the most disappointing team to the betting public finishing 22-42 ATS and finishing below .500 ATS every year.

**Acknowledgments:** I would like to thank Shane Sanders, Bhavneet Walia and Yang Ming Chang (all of Kansas State University) for helping me perform a meaningful statistical analysis on this data. All errors are the sole responsibility of the author.

**Conclusion:** Aridity does appear to be a strong indicator of teams being successful in college football games. Teams traveling from an arid state to a humid state face a more significant disadvantage than the general betting public believes. This disadvantage is significant at the five percent level. It appears to be more difficult than the general public understands to travel from an arid state to a humid state and compete in college football. I hypothesize that this significant disadvantage is due to the significant differences in aridity and temperature that exist when the majority of these games are being played (August and September) and difficulties players face when trying to adjust to warmer temperatures and humidity. There certainly may be other significant causes that could also help explain this difference (differences in altitude or miles traveled etc.) but testing aridity in

this case appears to capture significant differences in success levels against the point spread.

Arid teams are more successful than one might expect against the spread when hosting humid teams although this difference in success is not significant at the five percent level. Perhaps this difference would be significant if the majority of these games between arid teams and humid teams took place later in the season (October and November) when it might be more difficult to adjust to the arid/cooler climate. I would like to extend this research by testing for differences in the date of the contest and the severity of the differences in aridity in future research.

## References

- Prentice Hall Publishing, (2004).  
“Statistics for Managers Using Microsoft Excel. 4<sup>th</sup> Edition.” Chapter 9.  
<https://www.ssualumni.org/users/s/seward/211file/chap09.ppt#379,30>, Two  
Population Proportions
- Steele, Phil and Associates (2005): Phil Steele’s 2005 College Football Preview, North Coast Sports Publishing, Cleveland OH
- Steele, Phil and Associates (2006): Phil Steele’s 2006 College Football Preview, North Coast Sports Publishing, Cleveland OH