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The Dreaded Middle Seeds – Are They the Worst Seeds in the NCAA Basketball Tournament?

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Abstract

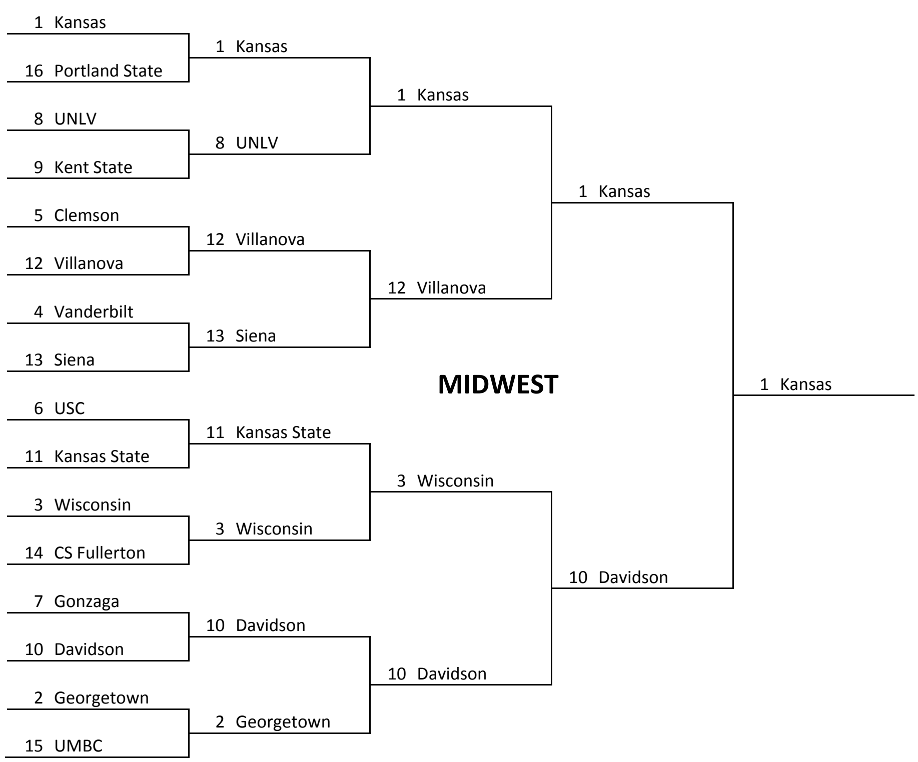
The following quote from Gregg Doyel in reference to the National Collegiate Athletic Association (NCAA) men's basketball tournament appeared on CBSSports.com on March 21, 2009. "For teams with a realistic chance at winning multiple games in the NCAA tournament,…the worst seed to have is the No. 8 or the No. 9. That's statistical certainty." Is it really "statistical certainty"? This papers attempts to answer this question. Data concerning the number of games won by teams seeded 8, 9, 10, 11, and 12 were collected from the NCAA men's and women's tournament brackets dating back to 1985 and 1994, respectively. It was found that among all teams entering the tournament, the 10, 11, and 12 seeds do not appear to have a statistical advantage over the 8/9 seeds. However, if only teams that win their first game are considered, the 10 seeds have a significantly greater mean number of wins than the 8/9 seeds in the men's tournament; and the 10, 11, and 12 seeds in the men's tournament and the 11 seeds in the women's tournament have advanced to the Sweet Sixteen (at least two wins) a significantly greater proportion of times than the 8/9 seeds.

KEYWORDS: basketball, tournament seeding, NCAA, March Madness

1. INTRODUCTION

Every year, the National Collegiate Athletic Association (NCAA) sponsors the Division I men's and women's basketball championship tournaments beginning in March. The top 65 men's teams and the top 64 women's teams in the country are given bids to play in the championship tournaments each year. Approximately half of these teams are granted automatic bids for winning their respective conference tournaments or championships. The remaining teams are chosen by an NCAA committee. This committee is also charged with the task of deciding which teams will play each other in the opening rounds of the tournaments. This is done by dividing the teams into four regionals and seeding (from 1 to 16) the teams within each regional, where the teams deemed best by the committee are given the highest seeds (seeds 1, 2, 3, etc.). The format of each regional is a classic single elimination tournament where the top seeds play the lower seeds in the first round, thus giving an advantage to the teams that have earned a top seed. An example of a regional bracket is displayed in Figure 1.

Figure 1. 2008 Midwest men's regional bracket



Notice that the teams seeded in the middle, the 8 and 9 seeds, will play each other in the opening round and the winner will play the winner of the 1 vs. 16 match-up in the second round; the winner of the 7 vs. 10 game in the opening round will face the winner of the 2 vs. 15 match-up in the second round; and so on. Therefore, while the 8 and 9 seeds appear to have an advantage over the lower seeds in the opening round; in the second round, that advantage is gone, given that the winner of the 8 vs. 9 game will most likely play the 1 seed in the second round, whereas the winner of the 7 vs. 10 game will most likely play the 2 seed, the winner of the 6 vs. 11 game will most likely play the 3 seed, and so on.

The following quote from Gregg Doyel in reference to the men's tournament appeared on CBSSports.com on March 21, 2009.

> "For teams with a realistic chance at winning multiple games in the NCAA tournament,…the worst seed to have is the No. 8 or the No. 9. That's statistical certainty."

Is it really "statistical certainty"? That's a strong statement to make. Doyel goes on to write,

> "Why? Because in the second round, the No. 1 seed in the region awaits. Every time. The top seed has never, as in *ever*, lost to the No. 16 seed. So if you're the eighth or the ninth seed, don't plan to stay long in the NCAA tournament."

Doyel is correct that the No. 1 seed has never lost to the No. 16 seed in the men's tournament and has only lost once in the women's tournament (No. 16 Harvard over No. 1 Stanford in 1998). Consequently, the No. 8 vs. No. 9 winner will most likely face a 1 seed in the second round of the tournament; and the lower seeds, if they win in the first round, will not have as difficult opponents in the second round as the 8 or 9 winner. But, is this difference enough to say that the worst seed to have is the No. 8 or No. 9 with "statistical certainty"?

In this paper, we will attempt to address Doyel's claim of "statistical certainty". Obviously, the worst seed to have is 16, since no 16 seed has ever defeated a 1 seed in the men's tournament and only one 16 seed has defeated a 1 seed in the women's tournament. We assume what Doyel meant to argue is that it would be better to receive a slightly lower seed than to be seeded 8 or 9. Specifically, we want to know whether it is statistically better to receive a 10, 11, or 12 seed than an 8 or 9 seed. To answer this question we must define what is meant by 'better'. Clearly, the ultimate goal of any team in an NCAA tournament is to win the entire tournament and be crowned national champion, so the first question we will address is,

(1) Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to advance as far as possible in the tournament?

But, as in any sport, there are always secondary goals, such as winning a conference championship, beating an in-state rival, achieving a team first, etc. Such goals in the NCAA tournament are to make it to the Sweet Sixteen, Elite Eight, and/or Final Four by winning the first two, three, and/or four rounds in the tournament, respectively. Therefore, the second question we will address is,

(2) Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to make it to the Sweet Sixteen, Elite Eight, or Final Four?

These questions will be addressed with respect to both the men's and women's tournaments separately. In section two we will summarize previous studies concerning the NCAA basketball tournaments; in section three, we will describe the data and how it was used to address each question; in section four, we will present the results of our analysis; and finally, in section five, we will close with a discussion.

2. Previous Studies

Much attention is given to the NCAA basketball tournaments each year both in the main-stream media and to a lesser degree in scholarly publications. Coleman and Lynch (2009) studied the degree to which factors used by the NCAA committee to select and seed teams is related to whether or not a team wins once the tournament begins. Other researchers have developed models for predicting the probability of teams winning their regional tournaments and margin of victory based on seed (Boulier and Stekler, 1999; Caudill, 2002; Caudill and Godwin, 2002; Schwertman at al., 1991; Schwertman et al. 1996; Smith and Schwertman, 1999). Carlin (1996) extended these probability models to include additional independent variables including margin of victory during the opening round. Still others have studied the various methods of seeding single-elimination tournaments (Schwenk, 2000). Only one scholarly paper, however, addresses the advantages (or disadvantages) of being seeded in the middle (No. 8 or 9). Baumann et al. (2010) identify what they call an anomaly in the NCAA tournament design. That is that 10 seeds have won a greater mean number of games, historically, than 8 or 9 seeds. In addition, a greater proportion of 10, 11, and 12 seeds have advanced to the Sweet Sixteen than 8 or 9 seeds. But, Baumann et al. do not provide any evidence to indicate that these differences are statistically significant, and they have only focused their attention on the men's tournament, excluding the women's tournament entirely.

In the main-stream media, sports writers seem to be obsessed with the middle seeds. During the 2009 tournaments alone, a minimal search produced four articles lamenting the predicament of being seeded No. 8 or 9 (Doyel, 2009; Fitzgerald, 2009; Keri, 2009; Marakovitz, 2009). And, like Doyel, many make statistical claims that are either not supported or only defended at a surface level. In another article, Sheldon Jacobson from the University of Illinois at Urbana-Champaign is quoted as saying "after the Sweet Sixteen, it is a statistical toss-up as to who wins the remaining games" (University, 2009), but Jacobson focused his attention on the top three seeds rather than the middle seeds. And, in all of these articles, the focus is entirely on the men's tournament with no mention of the women's tournament.

Seeing these deficiencies in the literature, it is the purpose of this research to investigate the performance of the middle seeds in the NCAA basketball tournaments. Specifically, we will investigate whether it is more advantageous to be seeded in the middle (8 or 9) or slightly lower (10, 11, or 12), and this analysis will be applied to both the men's and women's tournaments.

3. METHODS

The men's NCAA basketball tournament has been in existence since 1939, however, the field was not expanded to include at least 64 teams until 1985. The women's tournament began in 1982 but did not include 64 teams until 1994. For this study, only the years in which at least 64 teams were included in the tournaments were used. Data through 2009 were collected from the Official 2010 NCAA Men's and Women's Final Four Records Books. The 2010 brackets for both the men and women were downloaded from NCAA.com.

Each year there are four each of the 8, 9, 10, 11, and 12 seeds, one from each regional, resulting in 104 of each seed in the men's tournament from 1985 to 2010, and 68 of each seed in the women's tournament from 1994 to 2010. The summary statistics for the number of wins for each seed are shown in Table 1 as well as the number (and percent) of teams in each seed that have made it to the Sweet Sixteen (at least two wins), Elite Eight (at least three wins), and Final Four (at least four wins). Based strictly on the summary statistics presented in Table 1, there does not appear to be much difference among the five seeds, with one exception. The proportions of 8 and 9 seeded teams in the men's tournament advancing to the Sweet Sixteen appear to be much smaller than the proportions of 10, 11, and 12 seeded teams advancing to the Sweet Sixteen, but is this difference great enough to be statistically significant? This question will be explored further in section 4.

Table 1. Summary statistics for the total number of wins by seed and the number of each seed in the Sweet Sixteen, Elite Eight, and Final Four.

a. Men's tournaments from 1985 to 2010 ($n = 104$)

Seed	Mean	Std. Dev.	Range	Sweet 16 (%)	Elite 8 (%)	Final 4 (%)
8	0.65	0.99	0 - 6	9 (8.7)	6 (5.8)	3 (2.9)
9	0.59	0.60	0 - 3	4 (3.9)	1 (1.0)	0
10	0.63	0.92	0 - 3	18 (17.3)	7 (6.7)	0
11	0.49	0.87	0 - 4	12 (11.5)	4 (3.9)	2 (1.9)
12	0.52	0.80	0 - 3	18 (17.3)	1 (1.0)	0

b. Women's tournaments from 1994 to 2010 ($n = 68$)

Seed	Mean	Std. Dev.	Range	Sweet 16 (%)	Elite 8 (%)	Final 4 (%)
8	0.49	0.53	0 - 2	1 (1.5)	0	0
9	0.60	0.69	0 - 4	3 (4.4)	1 (1.5)	1 (1.5)
10	0.37	0.54	0 - 2	2 (2.9)	0	0
11	0.38	0.65	0 - 2	6 (8.8)	0	0
12	0.25	0.47	0 - 2	1 (1.5)	0	0

With respect to the design of the regional bracket, the 8 and 9 seed positions are virtually identical; therefore, the 8 and 9 seeds were combined and compared to the 10, 11, and 12 seeds to answer the two questions of interest. The 8 and 9 seeds, however, are not independent since they play each other in the opening round. Because of this, it was necessary to select random samples (one for the men's tournament and one for the women's) of the 8 and 9 seeds such that none of the 8 seeds in the samples played the 9 seeds in the samples. The random samples were selected as follows. Half of the 8 seeds were randomly sampled using SAS version 9.1. These random samples were then merged with the 9 seeds so that the 9 seeds from the same year and regional as the 8 seeds in the samples were thrown out. This random sample of the 8 and 9 seeds combined was then compared to all of the 10, 11, and 12 seeds. There is only one instance of any of these seeds (other than 8 vs. 9) playing each other. In the West Regional of the 2002 men's tournament, the 8 seed, UCLA, faced the 12 seed, Missouri. UCLA, however, was not randomly selected for inclusion in the sample; therefore, none of the teams in either of the samples played any of the other teams in their respective tournaments.

To address the first question (Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to advance as far as possible in the tournament?) we performed an analysis of variance (ANOVA) to see if there is a significant difference between mean number of wins for each seed. This ANOVA was followed by one-tailed Dunnett multiple comparisons with the 8/9 seeds as the control group. To address the second question (Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to make it to the Sweet Sixteen, Elite Eight, and/or Final Four?) we performed Pearson's chi-squared tests to see if there is a difference in the proportions of teams seeded 8/9, 10, 11, and 12 that advance to at least the Sweet Sixteen, Elite Eight, and Final Four. Where necessary, Fisher's exact test was used in place of Pearson's chi-squared test. If the chi-squared test resulted in a significant p-value ($p < 0.05$), pairwise one-tailed fisher's exact tests comparing the 10, 11, and 12 seeds to the 8/9 seeds (control) were performed using a permutation-based *p*-value adjustment.

Since the 8 and 9 seeds appear to have an advantage until the second round, the entire analysis was repeated for samples of teams with at least one win. This was done to determine whether the difference in the seeds is the same if a team can make it past the first round. In this case, the issue of dependence between the 8 and 9 seeds disappears. Therefore, all 8 and 9 seeds with at least one win were included in this analysis. There is still one instance, mentioned previously, of two teams playing each other (the 8 seed, UCLA, vs. the 12 seed, Missouri, in the West Regional of the 2002 men's tournament); consequently, these two teams were excluded from the analysis. SAS version 9.1 was used to perform all tests described here.

4. RESULTS

a. Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to advance as far as possible in the tournament?

The results of the ANOVA and Dunnett multiple comparisons are displayed in Table 2. In Table 2a, all 10, 11, and 12 seeds were included along with a random sample of half each of the 8 and 9 seeds. In Table 2b, only teams with at least one win were included. From Table 2a, we see that the 8/9 seeds have the second highest mean number of wins in the men's tournament and the highest mean number of wins in the women's tournament. Neither ANOVA, however, resulted in a significant *p*-value. In Table 2b, this relationship nearly reverses. Specifically, the 8/9 seeds have the lowest mean number of wins in the men's tournament and the second lowest mean number of wins in the women's tournament, and the difference between the means for the men's tournament was found to be significant ($p = 0.0197$). The Dunnett multiple comparisons indicate that the mean number of wins for the 10 seeds (1.61) is significantly higher than the mean number of wins for the 8/9 seeds (1.23) ($p = 0.0098$). The mean number of wins for the 11 (1.55) and 12 (1.50) seeds are not significantly greater than the mean number of wins for the 8/9 seeds at the 0.05 level, but they are both significant at the 0.10 level ($p = 0.0521$ and $p = 0.0967$, respectively).

Table 2. Mean number of wins for teams seeded 8/9, 10, 11, and 12

a. Random sample of 8 and 9 seeds

		Seed				
		8/9	10	11	12	*p*-value
Men	*n*	104	104	104	104	
	Mean	0.61	0.63	0.49	0.52	0.5529
	Std. Dev.	0.74	0.92	0.87	0.80	
Women	*n*	68	68	68	68	
	Mean	0.46	0.37	0.38	0.25	0.1840
	Std. Dev.	0.53	0.54	0.65	0.47	

b. All teams with at least one win

		Seed				
		8/9	10	11	12	*p*-value
Men	*n*	103	41	33	34	
	Mean	1.23	1.61*	1.55	1.50	0.0179
	Std. Dev.	0.76	0.77	0.87	0.51	
Women	*n*	68	23	20	16	
	Mean	1.09	1.09	1.30	1.06	0.1571
	Std. Dev.	0.41	0.29	0.47	0.25	

* Means marked with an * are significantly greater than the corresponding mean for the 8/9 seeds at the 0.05 level using Dunnett's adjustment.

b. Is it better to receive a 10, 11, or 12 seed than an 8 or 9 seed if the goal is to make it to the Sweet Sixteen, Elite Eight, and/or Final Four?

Table 3 displays the results of the chi-squared tests. Similar to Table 2, Table 3a contains the results for all 10, 11, and 12 seeds along with a random sample of half each of the 8 and 9 seeds, and Table 3b contains the results for only teams with at least one win. In Table 3a, we see that only 6.7% of the 8/9 seeds in the men's tournament and 1.5% of the 8/9 seeds in the women's tournament have advanced to the Sweet Sixteen. In the men's tournament, nearly twice as many of the 10 (17.3%), 11 (11.5%), and 12 (17.3%) seeds have advanced to the Sweet Sixteen, and in the women's tournament, twice as many of the 10 seeds (2.9%) and 6 times as many of the 11 seeds (8.8%) have advanced. In each case, however, these differences are not great enough to be significant at the 0.05 level ($p = 0.0687$ and $p = 0.0992$ for the men's and women's tournaments, respectively). In the men's tournament, the differences in proportions are less extreme among teams advancing to the Elite Eight and even less among teams advancing to the Final Four. In the women's tournament, none of the 8/9, 10, 11, or 12 seeds included in the analysis have advanced beyond the Sweet Sixteen. Of the 8/9 seeds not included in the analysis, only one team has advanced beyond the Sweet Sixteen (No. 9 Seed Arkansas in the West regional of the 1998 tournament).

Among teams with at least one win, there are quite a few significant differences. Specifically, in the men's tournament, only 11.7% of the 8/9 seeds have advanced to the Sweet Sixteen; whereas 43.9% of the 10 seeds, 36.4% of the 11 seeds, and 50.0% of the 12 seeds have advanced to the Sweet Sixteen. The proportions for the 10, 11, and 12 seeds were all found to be significantly greater than the proportion for the 8/9 seeds ($p < 0.0001$, $p = 0.0040$, and $p < 0.0001$, respectively). A significant difference was also found among the proportions of teams with at least one win advancing to the Elite Eight in the men's tournament ($p = 0.0334$). Only 6.7% of the 8/9 seeds have advanced to the Elite Eight. In contrast, approximately twice the proportion of 10 and 11 seeds have advanced to the Elite Eight (17.0% and 12.1%, respectively). However, when considering the seeds pairwise these differences are not significant. In the women's tournament, the only significant difference was found between the proportions of 8/9 seeds (5.9%) and 11 seeds (30.0%) advancing to the Sweet Sixteen ($p = 0.0110$).

Table 3. Number (%) of teams seeded 8/9, 10, 11, and 12 advancing to the Sweet Sixteen, Elite Eight, and Final Four

a. Random sample of 8 and 9 seeds

		Seed				
		8/9	10	11	12	*p*-value
Men	*n*	104	104	104	104	
	Sweet 16	7 (6.7)	18 (17.3)	12 (11.5)	18 (17.3)	0.0687
	Elite 8	3 (2.9)	7 (6.7)	4 (3.8)	1 (1.0)	0.1777
	Final 4	1 (1.0)	0	2 (1.9)	0	0.6223
Women	*n*	68	68	68	68	
	Sweet 16	1 (1.5)	2 (2.9)	6 (8.8)	1 (1.5)	0.0992
	Elite 8	0	0	0	0	
	Final 4	0	0	0	0	

b. All teams with at least one win

		Seed				
		8/9	10	11	12	*p*-value
Men	*n*	103	41	33	34	
	Sweet 16	12 (11.7)	18 (43.9)*	12 (36.4)*	17 (50.0)*	<0.0001
	Elite 8	7 (6.7)	7 (17.0)	4 (12.1)	0	0.0334
	Final 4	3 (2.9)	0	2 (6.1)	0	0.2605
Women	*n*	68	23	20	16	
	Sweet 16	4 (5.9)	2 (8.7)	6 (30.0)*	1 (6.3)	0.0272
	Elite 8	1 (1.5)	0	0	0	1.0000
	Final 4	1 (1.5)	0	0	0	1.0000

* Proportions marked with an * are significantly greater than the corresponding proportion for the 8/9 seeds at the 0.05 level using a permutation-based adjustment.

5. Discussion

Doyel's claim of "statistical certainty" appears to be at least partially supported by the data. No significant differences between the mean number of wins or the proportions of teams advancing to the Sweet Sixteen or beyond were found among all 8/9, 10, 11, and 12 seeds. Among teams that win their first game, however, there are quite a few significant differences. Specifically, in the men's tournament, the 10 seeds have a significantly higher mean number of wins than the 8/9 seeds and the 10, 11, and 12 seeds have a significantly higher proportion of teams advancing to the Sweet Sixteen than the 8/9 seeds. So, it appears that if a lower seeded team (seeds 10, 11, or 12) in the men's tournament can win their first game, they have a statistical advantage over the teams seeded in the middle (8/9 seeds).

In the women's tournament, only one significant difference was found. That is that the 11 seeds who win their first game have a greater chance of winning another game and advancing to the Sweet Sixteen than do the 8/9 seeds. Beyond the Sweet Sixteen, only one team seeded 8, 9, 10, 11, or 12 has ever advanced (No. 9 Seed Arkansas in the West regional of the 1998 tournament). It appears that there is a greater gap between the top seeded and middle/lower seeded teams in the women's tournament than in the men's tournament with respect to basketball talent and prowess. Perhaps this relationship and other similarities and differences between the men's and women's tournaments are worthy of future study.

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