

# GMBA 7098: Statistics and Data Analysis (Fall 2014)

## Do Sumo Wrestlers cheat?

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# Sumo

- ▶ In Japan, sumo is one of the most important sports.
  - ▶ Not just competitions.



## Incentives for sumo cheating

- ▶ **Cheating** in sport competitions is common.<sup>1</sup>
  - ▶ Because everyone wants to win.
  - ▶ Either strong or weak, there is always an **incentive** to cheat.
- ▶ Is the incentive strong or weak in sumo wrestling?
- ▶ **Ranking** determines everything.
  - ▶ E.g., each of the top 40 earns at least \$170,000 a year while the 70th-ranked one earns only \$15,000.
- ▶ What determines one's ranking?

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<sup>1</sup>The story and data in this set of slides are adopted from *Freakonomics* and the paper “Winning isn’t everything: corruption in sumo wrestling,” *The American Economic Review* **92**(5), 1594–1605, by M. Duggan and D. Levitt.

## The eighth victory

- ▶ The 66 highest-ranked sumo wrestlers (*rikishi*) play in six elite tournaments (*basho*) in each year.
  - ▶ Each wrestler has 15 bouts per tournament, one per day over 15 consecutive days.
  - ▶ If one gets more than 8 wins, his ranking will rise.
  - ▶ Otherwise, his ranking fails.
  - ▶ **The eighth win** really matters: promotion or demotion.

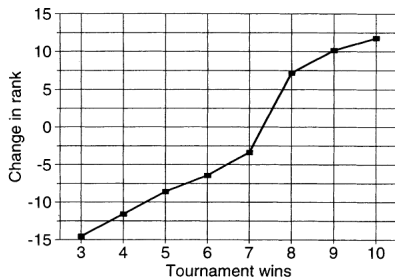


FIGURE 1. PAYOFF TO TOURNAMENT WINS

## The final day

- ▶ Suppose two wrestlers meet in the last day.
  - ▶ One has a 7-7 record while the other has an 8-6 record.
  - ▶ Does the former has an incentive to bribe the latter for a win?
- ▶ How to test whether this really happened? Data analysis!
- ▶ Data:
  - ▶ Over 32,000 bouts in the top rank (*Sekitori*) of Japanese sumo wrestling between January 1989 and January 2000.
  - ▶ 281 wrestlers.
  - ▶ In the data set, two wrestlers in average compete in 10 bouts.
  - ▶ More than half of all wrestlers end a tournament with 7, 8, or 9 wins.

## 7-7 vs. 8-6 (and 9-5) on the last day

- ▶ If a wrestler gets more than 10 wins, it is likely for him to win the championship or several prizes.
  - ▶ But this rarely happens to wrestlers with fewer than 10 wins.
  - ▶ 7-7 vs. 8-6 and 9-5 are really the cases to investigate.
- ▶ The first observation:

Opponent	Predicted win percentage of a 7-7 wrestler	Actual win percentage of a 7-7 wrestler
8-6	48.7%	<b>79.6%</b>
9-5	47.2%	<b>73.4%</b>

- ▶ 7-7 wrestlers really do astonishingly well against 8-6 and 9-5 opponents.
- ▶ Is that a proof or an evidence?

## 7-7 vs. 8-6 (and 9-5) on the next tournament

- ▶ Consider the **next** time the 7-7 and 8-6 wrestlers meet when neither one is 7-7 or 8-6.
  - ▶ Now we should not expect 80%. 50% may be more reasonable.
- ▶ However, the winning percentage is only 40% of the next match.
  - ▶ It is 50% of the next next match.
- ▶ It is quite possible that there is an agreement: “You let me win today, when I really need the victory, and **I’ll let you win** the next time.”
  - ▶ Such an agreement does not preclude a cash bribe.

## Allegations of match rigging

- ▶ Occasionally, people discuss about suspicious **allegations of match rigging** on media.
  - ▶ Period 1: April and May of 1996.<sup>2</sup>
  - ▶ Period 2: Late 1999 to early 2000.
- ▶ Three tournaments are considered under high media scrutiny.
- ▶ In these tournaments, 7-7 wrestlers won **only 50%** against 8-6 ones.

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<sup>2</sup>A former sumo wrestler came forward to talk about this. Then another former wrestler also decry rigged matches. Ironically, both of them died a few weeks later, just hours apart, in the same hospital.



## Conclusions

- ▶ The ranking rules of sumo wrestling provide strong **incentives** for wrestlers to cheat.
- ▶ **Data analysis** helps to find some hidden facts.
  - ▶ One simple analysis may not be enough.
  - ▶ Sometimes analyses from multiple perspectives help.
  - ▶ Even descriptive statistics may be powerful.
- ▶ "Sunlight is said to be the best disinfectant."