

# Whip It Like A (Wo)Man: Survival Analysis of Minority Contestants in *Masterchef Junior*

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Fall 2018

## 1 Introduction

*Masterchef Junior* is a popular American cooking show featuring children ages eight to thirteen. It is based on a similar show, *Junior Masterchef*, a U.K.-based children’s cooking show. In the show, a cohort of children (between 15 and 25 in a typical season) compete for the coveted *Masterchef Junior* trophy and \$100,000. Celebrity judges such as Gordon Ramsay, an international cooking sensation, Joe Bastianich, a successful restaurateur, Graham Elliot, a three Michelin star recipient, and Christina Tosi, a renowned pastry chef and two-time James Beard Award winner, evaluate the contestants’ performances in weekly challenges and ultimately eliminate at least two people each week until only the top two remain. The finale is an elaborate display of culinary technique and finesse as the finalists prepare a self-designed three course meal for the judges.

As much fun as the show is to watch, it is not immune to biases we hold as to what a chef “looks like.” Subtle comments are often made towards white male contestants that they remind the judges of themselves as young people. In fact, the white male contestants reflect the industry as a whole. A 2015 study by the Restaurant Opportunities Centers United (ROC United) found that “81 percent of management positions in 133 fine-dining restaurants were held by white employees” [5], many of whom are male. Women of color often are questioned and challenged when they rise to positions of authority in a professional kitchen. “[Jamie] Suddoth, 37, works at a market-cafe hybrid called Earl’s Grocery and runs Jamie’s Cakes and Classes, both in Charlotte, but she has dabbled in other specialties. No matter what part of the kitchen she walks into, she feels a need to prove her talent as a woman of color. ‘It’s a male-dominated field,’ Suddoth added. “I don’t get respect right off the bat” [5]. To date, there have been only five black Beard Foundation Best Chef Award nominees. Discrimination against women and people of color manifests itself in wage discrepancies as well. According to the ROC United study on restaurants in California, white female restaurant employees make 80 percent of what white male restaurant employees earn on average. That gap is consistent for other minority groups as well. Male employees of color earn 82 percent while women of color earn 71 percent

of what their white male counterparts earn. Some of this is explained by a lack of minorities in the highest paying positions which is another cause for concern [6]. Aggressive behavior in the kitchen, often coming from well-known male chefs, is regarded as powerful and captivating [1]. The “bad boy” attitude has kept many women out. Gordon Ramsay, one of the show’s star judges, is one of the best examples of an explosive temper that undoubtedly draws in fans. In 2009, when ten female chefs won Michelin stars in the U.K., *The Telegraph* announced “It could be the beginning of the end for the foul-mouthed, macho, and defiantly male master chef” [2]. While managers may claim that the biases we hold as to how chefs look and behave does not adversely affect hiring and promotion outcomes, a 2009 study found that innate biases were predictive of “socially and organizationally significant behaviors” [4].

Innate biases that the chefs have about who *is* a chef often plays out in their commentary on different contestants. In a team challenge in season 2, the judges had to eliminate two of the three members of the losing team. They chose to keep Samuel, a white boy, over Sean, an Asian-American boy, because Samuel “looked most comfortable” even though Sean far out-performed him. Sean’s steak had “blown the other team’s out of the water” while Samuel “botched his fish and failed to bring his team together” [3]. Female contestants are often asked questions like “Could you do that again, or is this luck?” and “Is this a fluke?” while male contestants are asked how much they would charge for their dish at their future restaurant, even when they perform at a similar level. In part responding to this criticism, in its third season *MasterChef Junior* introduced a new female judge, Christina Tosi. In this paper we will rigorously investigate whether or not the introduction of a female judge changes the trajectory of minority contestants, both women and people of color. We hypothesize that the presence of a female judge will increase the survival of minority contestants. In section 2 we will discuss our data and methods, in section 3 we will discuss the results of our analysis, in section 4 we will discuss these results in context, and finally in section 5 we will provide some concluding remarks.

## 2 Data and Methods

To obtain our data, we copied tables we found on Wikipedia [7, 8, 9, 10, 11, 12] for each season that contained detailed information about the contestants and their statuses at the end of each episode. We then cleaned the data and added new columns that would be relevant to our analysis. One of these was a column for race, which we determined using photographs of the children and onscreen comments they made about their heritage and how it influenced their cooking. Our race values are either white or non-white for simplicity, and we classified races from the Mediterranean region as non-white.

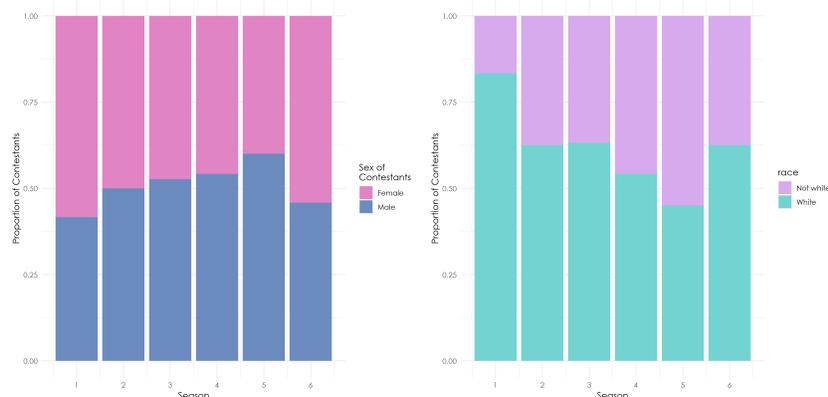
The table below contains each of the variables we added to our data, as well as an interpretation and range of values for each variable:

Variable	Interpretation	Values
sex	Sex of contestant	M = male F = female
age	Age of contestant	8-13
white	Race of contestant	0 = non-white 1 = white
weeks	Number of weeks contestant survived	1-15
status	Whether the contestant was censored or not	0 = censored 1 = exact
female_judge	Whether the contestant competed in a season that included a female judge	0 = no 1 = yes
weeks_pct	Percent of weeks contestant survived in their season	0-100

In this data, a contestant is right-censored if they won the season.

Using our complete data, we conducted some exploratory data analysis using our race and sex variables. Before applying any models, we created simple stacked bar charts to investigate the proportions of female vs. male and white vs. non-white contestants in each of the six seasons.

Figure 1: Demographic change over the six seasons of *MasterChef Junior*



(a) Change in proportion of female contestants.

(b) Change in proportion of white contestants.

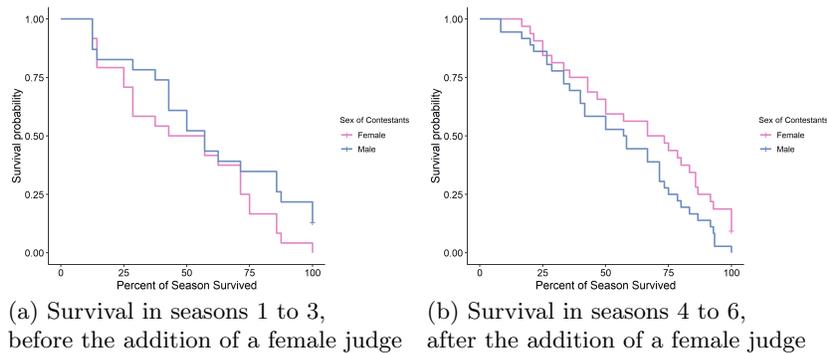
From these charts, we can see that over the seasons, there is generally a steady decrease in the proportion of female to male contestants and a steady increase in the proportion of non-white to white contestants. To further investigate these trends, we decided to consider the presence of a female judge and perform a more complicated analysis of our variables of interest. We did not make any assumptions about the distributions of the data and chose to use non-parametric methods. We produced four Kaplan-Meier curves to assess the survival of contestants by sex and then by race in both the presence and absence of a female

judge. Additionally, we tested the overall differences in survival rates using log-rank tests.

### 3 Results

First, we wanted to investigate survival rates by sex before and after the introduction of a female judge to the panel. We estimated survival rates non-parametrically with a Kaplan-Meier curve. In Figure 2, we can see that before the introduction of a female judge, at almost every time-point in the season, male contestants have a higher predicted survival rate than female contestants. At the points where about 15 percent of the season and about 60 percent of the season have passed, the curves are overlapping and we see little difference in survival. In seasons 4 to 6, though, it appears that female contestants have a higher predicted survival rate at most time-points. We also ran log-rank tests to ask whether or not there is a significant difference in survival for male and female contestants overall with and without a female judge. Without a female judge on the panel, there is not a significant difference at  $\alpha < 0.05$  because  $p = 0.149$  with only 47 observations. Additionally, with a female judge there is also not a significant difference in survival rates for male and female contestants at  $\alpha < 0.05$  because  $p = 0.068$  with only 68 observations. If we had more observations from an additional season (season 7 is expected to air in spring of 2019), we may see more significant results.

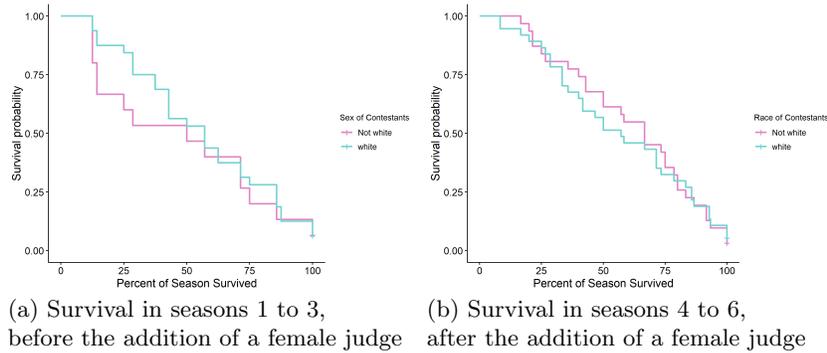
Figure 2: Survival (measured by percent of season) of Contestants by Sex



Next, we used the same non-parametric methods to assess the relationship between survival and race before and after the introduction of a female judge. Figure 3 shows that in seasons 1 to 3, white contestants generally have a higher predicted survival rate than non-white contestants. This trend is the most drastic in the first 50 percent of weeks passed, where there is a large gap between the predicted survival curves. In seasons 4 to 6, the survival curves are more similar to each other, with non-white contestants now having a higher overall

predicted survival rate. We also wanted to know whether or not the overall survival rates are significantly different. To measure this we used log-rank tests. We found that before the introduction of a female judge there is not a significant difference in survival at  $\alpha < 0.05$  because  $p = 0.529$  with only 47 observations. After the introduction of a female judge there is also not a significant difference in survival rates at  $\alpha < 0.05$  because  $p = 0.903$  with only 68 observations.

Figure 3: Survival (measured by percent of season) of Contestants by Race



Based on these plots, we decided to use accelerated failure time models with an interaction term between female judge and race as well as between female judge and gender to pick up on the relationship between those variables. We hypothesized that the interaction between female judge and gender would be significant and that it would predict higher survival for female contestants with a female judge present. There are clear patterns in these Kaplan-Meier curves, but AFT and Cox Proportional Hazards models would give a better way to quantify and assess them.

Table 1 below displays our results based on three different models for contestant survival by sex. These models include a controlled value for age as well as an interaction term between sex and whether or not a female judge was present in the season. Significance levels of coefficients are indicated by number of asterisks.

Table 1: Modeling Survival Time by Sex

	<i>Dependent variable:</i>		
	log(Percent of Season Survived)		
	<i>Weibull AFT</i>	<i>Log-Normal AFT</i>	<i>Cox Proportional Hazards</i>
	(1)	(2)	(3)
Age	0.097*** (0.036)	0.144*** (0.047)	-0.227*** (0.076)
Male	0.154 (0.148)	0.176 (0.189)	-0.472 (0.313)
Female judge present	0.346** (0.136)	0.500*** (0.178)	-0.885*** (0.293)
Male:Female judge present	-0.467** (0.190)	-0.521** (0.246)	1.263*** (0.412)
Intercept	3.021*** (0.382)	2.176*** (0.509)	
Observations	115	115	115
R <sup>2</sup>			0.130
Max. Possible R <sup>2</sup>			0.999
Log Likelihood	-522.235	-530.191	-419.355
$\chi^2$ (df = 4)	12.018**	13.732***	
Wald Test			16.430*** (df = 4)
LR Test			16.050*** (df = 4)
Score (Logrank) Test			16.608*** (df = 4)

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\*p<0.01

We can see that holding other variables constant, older contestants tend to survive longer, which makes sense because we expect them to have more experience cooking and a longer attention span. The results also indicate that when a female judge is on the panel, the chance of survival for male contestants decreases. An illustration of the effect of the interaction term on survival using the Weibull model is depicted in Figure 4 below. The survival curves show that in the presence of a female judge, the chance of survival for male contestants does indeed decrease, while the chance of survival for female contestants increases significantly. It should be noted that we have defined survival time in terms of percentage of the season rather than the number of episodes, since the number

of episodes per season tends to increase for later seasons.

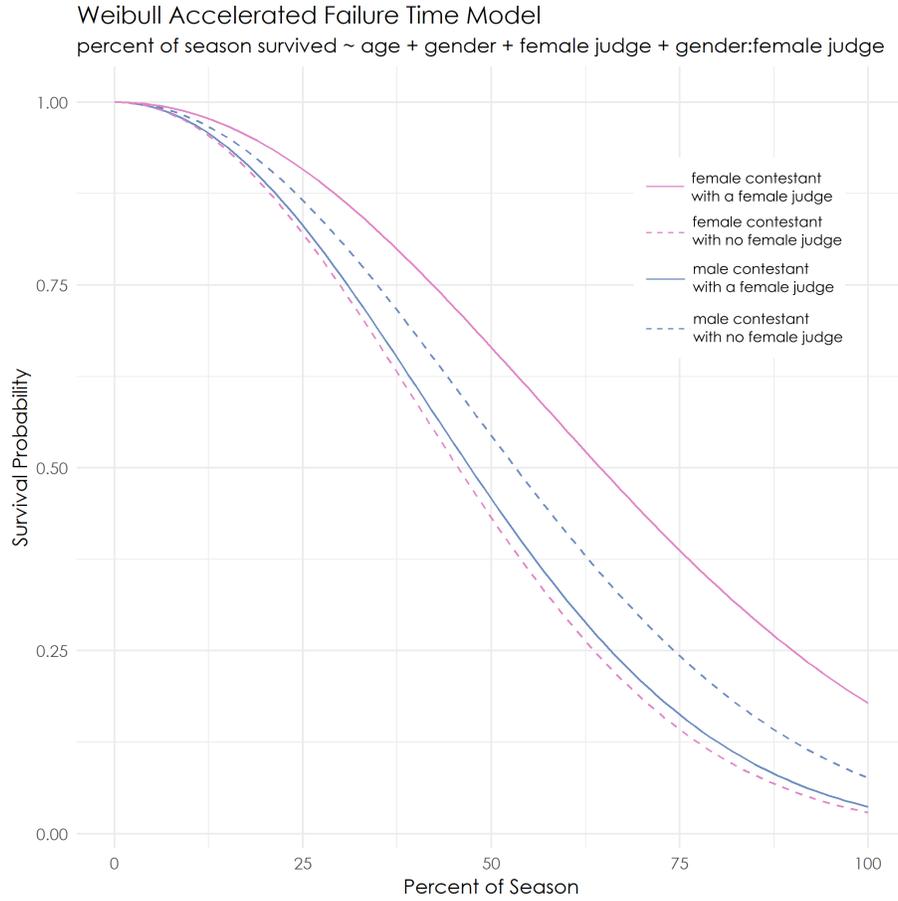


Figure 4: Survival Curves from Weibull AFT Model for Gender

In Table 2 below, we used the same models as in the analysis of survival by sex to investigate survival by race. Similarly, these models include a controlled value for age and an interaction term between race and presence of a female judge.

Table 2: Modeling Survival Time by Race

	<i>Dependent variable:</i>		
	log(Percent of Season Survived)		
	<i>Weibull AFT</i>	<i>Log-Normal AFT</i>	<i>Cox Proportional Hazards</i>
	(1)	(2)	(3)
Age	0.076** (0.035)	0.121*** (0.046)	-0.167** (0.072)
White	0.102 (0.161)	0.273 (0.204)	-0.214 (0.325)
Female judge present	0.176 (0.163)	0.452** (0.206)	-0.341 (0.330)
White:Female judge present	-0.095 (0.202)	-0.361 (0.258)	0.147 (0.409)
Intercept	3.255*** (0.412)	2.316*** (0.516)	
Observations	115	115	115
R <sup>2</sup>			0.048
Max. Possible R <sup>2</sup>			0.999
Log Likelihood	-525.652	-531.856	-424.528
$\chi^2$ (df = 4)	5.183	10.403**	
Wald Test			5.760 (df = 4)
LR Test			5.704 (df = 4)
Score (Logrank) Test			5.780 (df = 4)

*Note:*

\*p<0.1; \*\*p<0.05; \*\*\* p<0.01

As was true in the models for survival by sex, we see that as age of the contestants increases, so does their survival. However, we do not see the same significance in the interaction term for survival by race in the presence of a female judge as we do for survival by gender in the presence of a female judge. The survival curves pertaining to a female judge being on the panel (indicated by solid lines) in Figure 5 are consistent with this finding, as these curves are essentially identical for both white and non-white contestants. We will address why we hypothesize these results are not surprising in the next section of the paper.

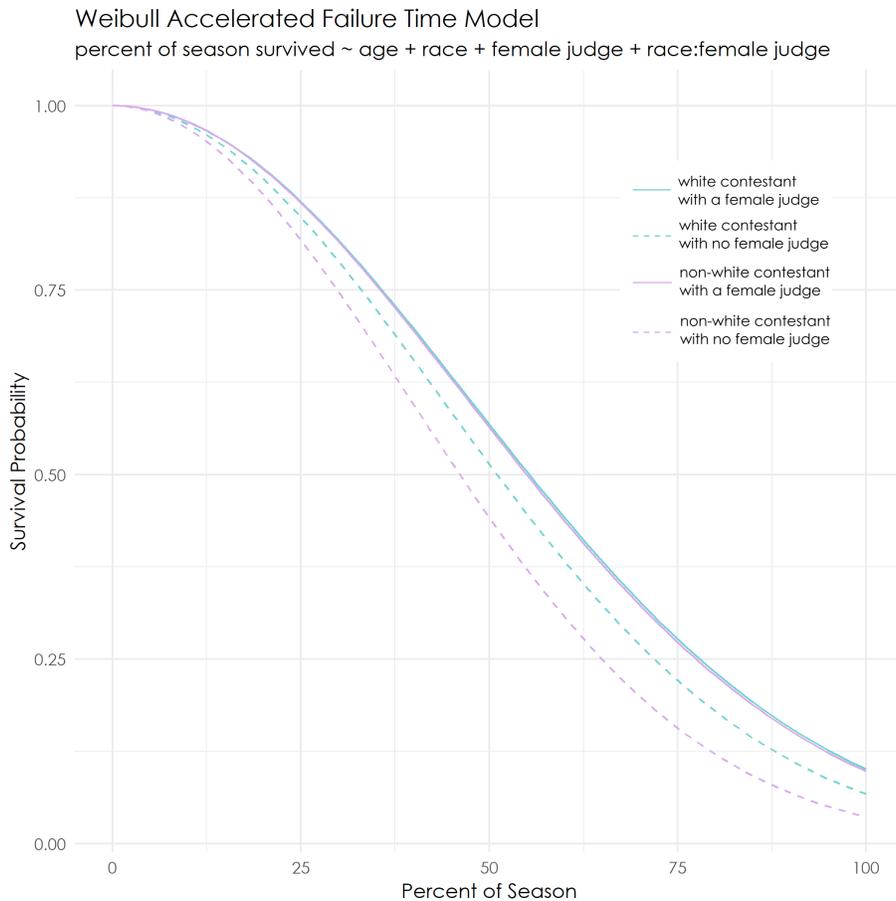


Figure 5: Survival Curves from Weibull AFT Model for Race

## 4 Discussion

Our original question that we set out to answer in this paper was whether or not the introduction of a female judge changes the trajectory of minority contestants, both women and people of color. We hypothesized that the presence of a female judge will increase the survival of minority contestants.

Our analysis has shown that when controlling for age, the presence of a female judge increases the probability of survival for female contestants. The relationship is not as strong for contestants of color, though. This is likely due to the fact that the sample size for contestants of color is quite small to begin with. Our results suggest that having more diverse judges and mentors on the show will in turn support more diverse contestants. By extension this is an argument

for promoting more diverse mentors in the culinary industry at-large. In the future we would advocate for including more non-white judges on *MasterChef Junior*. While for one season there were occasionally guest judges of color, they only appeared for an episode or two at a time.

Our results are in line with qualitative studies of discrimination in the restaurant industry. They are also in line with qualitative discussions specifically of *MasterChef Junior*. In our introduction we discussed issues of explosive tempers, lack of mentors, and questioning of abilities as well as a variety of other mechanisms that push minorities in the culinary industry out of positions of power. There are also claims that these cultural norms in the culinary industry are reflected in the way the judges on *MasterChef Junior* communicate with the young contestants. We have added to this conversation by using survival analysis methods to back up popular claims. Previously, much of the quantitative analysis included only raw counts of salaries and employees.

We think there are a few reasons that we saw these particular results of our analysis. Namely, as the show aired seasons 2 and 3, the producers started to receive more comments in popular media about the lack of female contestants reaching the final weeks of the competition. In part responding to these criticisms, Christina Tosi was hired to the panel of judges, and the initial pool of accepted contestants diversified. With the addition of Tosi to the panel, minority contestants arguably had a more relatable mentor. With a more diverse contestant pool, minority contestants likely felt less singled-out and had a stronger sense of belonging. In fact, the breakdown of contestants on the show is quite a bit more diverse than the demographic breakdown of the industry as a whole, a good sign of changes to come.

## 5 Conclusion

In this paper we have shown that a female judge on *MasterChef Junior* positively impacts the probability of survival for female contestants. It also positively impacts the probability of survival for contestants of color to a lesser degree, largely because of issues with sample size. We found these results while controlling for age as a proxy for cooking experience.

If we continued this research we would think of a way to calculate some sort of "power ranking" for each contestant. This would give us a way to assess whether certain contestants win because they are just better cooks, not because of biases. One way to explain the results we got is that the white male contestants may genuinely be better cooks for whatever reason. A power ranking would give us a way to control for this and ask a more refined question: at similar skill levels, do minority contestants perform better or worse than we would expect holding age constant? In a way, our model controls for skill by using age but that doesn't completely answer the question we are asking. For

example, there are eight-year-olds who have been cooking since they were four and thirteen-year-olds who learned to cook when they were twelve. In cases like that, the advantage of age may be nullified or significantly decreased.

We also acknowledge that there are numerous limitations in answering our research questions. First, the number of weeks and contestants (correlated) is not the same for each season. The seasons tend to get longer as time goes on and the last season is about twice as long as the first. This makes it difficult to do calculations by week so we instead chose to use percent of season. Another limitation is that we had to guess the race of contestants, which is prone to assumptions and errors. We also don't have data for the first couple of episodes for many of the seasons. Additionally, we don't have data on people who auditioned, only those who were accepted. This means we don't know how many minority contestants were accepted to begin with relative to the larger pool of applicants. Thus, our analysis reflects a bias towards people who survived long enough to get to the point where data is collected.

With these limitations in mind, we still think that our conclusions speak to an important point about visibility, diversity, and mentorship. Minority contestants on the show have measurably better outcomes with a more diverse judging panel. We also think this is a particularly interesting result because many of the children on the show have not yet been exposed to the biases in the culinary industry the same way that the judges have. In this way the judges are even more responsible for modeling good behavior in the kitchen while the children look to them for advice and development of skills. It further demonstrates that while the contestants are developing cooking skills on the show, they are also developing interpersonal skills that can later help them navigate the diversity issues they encounter. We hope our analysis can be a starting point for discussions like this in the future.

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