TALLYS YUNES

Pricing Buffalo Wings at Danny's Wok

We were just trying to make it easier for our customers.
— Danny Wang, restaurant owner

On a chilly, late-October morning in Philadelphia, Danny woke up to find out that an article had been published on the web about his restaurant. The peculiar way in which his menu displayed the prices for different order sizes of buffalo wings had rubbed a customer the wrong way, leading them to tweet a picture with the words "theres [*sic*] gotta be a better way to convey this information." The tweet generated tens of thousands of reactions, and was picked up by a BuzzFeed News reporter who wrote an entire piece on the story. Danny's e-mail inbox and voice mail were already full of messages from family and friends. He realized a mistake had been made and started to think about whether to try and fix it, or to capitalize on the attention. It was going to be a long day.

The Published Article

If you ever find yourself craving wings in Philadelphia, you may want to bring a calculator along.

4 Chicken Wings	4.55		24 Chicken Wings	27.25
5 Chicken Wings	5.70		25 Chicken Wings	27.80
6 Chicken Wings	6.80		26 Chicken Wings	28.95
7 Chicken Wings	7.95		27 Chicken Wings	30.10
8 Chicken Wings	9.10		28 Chicken Wings	31.20
9 Chicken Wings	10.20		29 Chicken Wings	32.35
10 Chicken Wings	11.35		30 Chicken Wings	33.50
11 Chicken Wings	12.50		35 Chicken Wings	39.15
12 Chicken Wings	13.60		40 Chicken Wings	44.80
13 Chicken Wings	14.75		45 Chicken Wings	50.50
14 Chicken Wings	15.90		50 Chicken Wings	55.60
15 Chicken Wings	17.00		60 Chicken Wings	67.00
16 Chicken Wings	18.15		70 Chicken Wings	78.30
17 Chicken Wings	19.30		75 Chicken Wings	83.45
18 Chicken Wings	20.40		80 Chicken Wings	89.10
19 Chicken Wings	21.55		90 Chicken Wings	100.45
20 Chicken Wings	22.70		100 Chicken Wings	111.25
21 Chicken Wings	23.80		125 Chicken Wings	139.00
22 Chicken Wings	24.95		150 Chicken Wings	166.85
23 Chicken Wings	26.10		200 Chicken Wings	222.50

sean
@seanposting

theres gotta be a better way to convey this information

6:24 PM - Oct 21, 2018

♡ 17.8K ◯ 5,060 people are talking about this

This is a real menu from Danny's Wok, a Chinese restaurant in West Philly. Whatever is going on in the pricing structure for their wings is a mystery that has captured the imagination of thousands of wing aficionados and Twitter users. Sean Woodall, the 24-year-old Philly resident who tweeted an image of the menu, said she has "no idea why the prices are so nonsensical" and didn't ask.

The price per wing (which will henceforth be known as PPW) has left a lot of people baffled, and it soon went viral on Twitter. What is the pattern?

Clayton K. 🌶
@clayton_kr

Replying to @seanposting @AsnoDeBuridan

can I just say that I'm deeply disturbed by

30
35
40
45
50
60
70
SEVENTY FIVE
80
90
100

like...stick to a pattern FOR CHRIST'S SAKE

10:43 PM - Oct 21, 2018

♡ 432   See Clayton K. 🌶's other Tweets   ⓘ

Juju
@jujuadams

Replying to @seanposting @tesselode

Up until 24 wings there's a pattern, but it goes off the rails on the second column. I would say someone made a mistake, but who am I to question a masterpiece such as this.

7:14 PM - Oct 21, 2018

♡ 39   See Juju's other Tweets   ⓘ

Fortunately, people are figuring out all the ways to "hack the menu" and get those big savings.

Carter
@_c_s_b_

Replying to @seanposting @JamesRambin

Purchasing 200 wings instead of 4 brings the per-unit cost down by less than two full cents.

7:01 PM - Oct 21, 2018

♡ 881   ◯ 45 people are talking about this   ⓘ

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blizzz
@blizzzilla

Replying to @seanposting

If you want 200 wings you can save 5 cents by buying 150+50 separately.

8:01 PM - Oct 21, 2018

♡ 239   See blizzz's other Tweets

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junie 🐝
@strwberry_wine

get 24 chicken wings instead of 4 and save.... five cents per wing??? get 80 wings instead of 4 and save.... $1.90!

6:28 PM - Oct 21, 2018

♡ 221   See junie 🐝's other Tweets

And then Math Twitter got involved. They literally wrote formulas breaking down the PPW.

Lynn 🐶½
@chordbug

this formula breaks down at the 24 wing mark, and I can't figure out what on earth went wrong at that point
pic.twitter.com/ICmDu7j13b

7:16 PM - Oct 21, 2018

$$n \text{ wings} \quad \approx \quad \frac{1}{20}\left\lfloor 20 \times \frac{\$17 \times n}{15} \right\rfloor$$

♡ 1,278   💬 154 people are talking about this

Six
@SoulreaverSix

4 Chicken wings   (4.55+n)
where n is an additional chicken wing and n=$1.15 two out of every third time where n=$1.10

6:31 PM - Oct 21, 2018

♡ 126   See Six's other Tweets

(I'm bad at math and cannot summarize the formulas for you. Please don't yell at me in the comments. I still use my phone to calculate tips.)

And then come spreadsheets and graphs!

SpooklopsDragon @CyclopsDragon · Oct 22, 2018
Replying to @seanposting

It seems to me that the pattern is 3.40 per 3 wings, with a 0.55 wing at each 25. The first two are 1.15, the third is 1.10. This pattern holds up to 75, where they add 5c for some reason, then subtract that 5c at 80. Subtract 5c at 125, add 5c at 150, add 5c again at 200. Shrug.

SpooklopsDragon
@CyclopsDragon

Here's a spreadsheet where I extrapolated the prices of 1-3 wings, then tracked the difference by subtracting the price of the last multiple of 25 (in column C). You can see the deviation when it hits 75 compared to 50, then continue tracking the deviations as I laid them out. pic.twitter.com/Se7RrypOym

10:55 PM - Oct 22, 2018

	A	B	C
1	1	1.15	
2	2	2.30	
3	3	3.40	
4	4	4.55	
5	5	5.70	
6	6	6.80	
7	7	7.95	
8	8	9.10	
9	9	10.20	
10	10	11.35	
11	11	12.50	
12	12	13.60	
13	13	14.75	
14	14	15.90	
15	15	17.00	

♡ 291 ♡ 38 people are talking about this

Todd Gamblin
@tgamblin

I'm not seeing the pattern but there's an awesome minimization problem in here somewhere to get the best price for N wings. pic.twitter.com/I4F61VAJin

7:56 PM - Oct 22, 2018

WINGS

♡ 105 ♡ 22 people are talking about this

dilski
@dilski

pic.twitter.com/bJ0Y8iUluP

7:04 PM - Oct 21, 2018

♡ 297 ♡ 35 people are talking about this
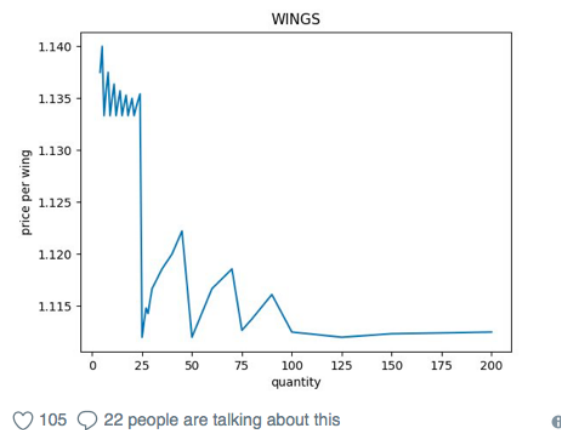
BuzzFeed News asked an employee of Danny's Wok what the deal is with the pricing structure, and he didn't know. A manager at the restaurant could not immediately be reached.

As for Woodall, she theorizes that maybe "they wanted to make it as easy as possible for customers to know how much they would pay for any possible amount of wings, without the cashier needing to clarify or calculate." "Still no idea as to why the 25th wing is $0.55," she added. "Maybe it's a mystery better left unsolved."

Any Publicity is Good Publicity, Right?

The effects of bad publicity have been studied in the Marketing literature for many years. Consider, for example, the following excerpts from one such study:[2]

> Negative publicity often hurts. When a rumor circulated that McDonald's used worm meat in its hamburgers, sales decreased by more than 25%. Coverage of musician Michael Jackson's bizarre behavior and brushes with the law destroyed his career. Viacom Inc. Chairman Sumner Redstone estimated that negative publicity cost Mission Impossible 3 more than $100 million in ticket sales, and film pundits have suggested that it is "almost impossible to recover from bad buzz." Academic research corroborates this sentiment and casts further doubt on the old adage that "any publicity is good publicity." Negative publicity about a product has been shown to hurt everything from product and brand evaluation to firm net present value and sales. A number of intriguing examples, however, seem to contradict these findings. A wine described "as redolent of stinky socks," for example, saw its sales increase by 5% after it was reviewed by a prominent wine website. Similarly, although the movie Borat made relentless fun of the country of Kazakhstan, Hotels.com reported a "300 percent increase in requests for information about the country" after the film was released. Although these may just be idiosyncratic examples, they suggest that negative publicity may not always be a bad thing. Can negative publicity actually have a positive effect? And if so, when?

The authors' rationale and hypothesis are as follows:

We argue that negative publicity may have positive effects, however, by increasing product awareness or accessibility. Consideration appears to explain much of choice. Consumers have finite attention, and the sheer multitude of cultural offerings means that most consumers will not be aware of every book, movie, or album that is released...This distinction between evaluation and awareness or accessibility is analogous to previous work on different effects of advertising. Advertising can affect preferences for various options given that they are considered, but it can also affect choice by changing which options consumers consider, independently of their preferences for those options.

It appears that time plays an important role in all of this as well, as the authors report from one of their experiments:

Few consumers want to read a bad book or see a movie they know will be terrible, but over time, the valence of publicity for unknown products may be forgotten, leading positive and negative reviews to have a similar effect...Regardless of whether participants reported purchase likelihood right away or after a delay, negative publicity hurt purchase of well-known products. For unknown products, however, the effect of publicity valence dissipated over time. Consistent with the notion that publicity valence for unknown products fades in memory, there was no effect of publicity valence on purchase likelihood of unknown products after a delay. In addition, for unknown products, the effect of a negative review became more positive over time. This suggests that whereas publicity valence fades over time, increased awareness may remain, which can boost purchase likelihood.

Finally, they end with some interesting unanswered questions:

Future research might examine other factors that shape how publicity and product reviews influence consumer choice. One such factor is the extremity of the review. Whereas Study 2 illustrated that the effects of negative publicity become more positive after a delay, its immediate effects may depend on whether it is weakly or strongly negative. Whereas really negative publicity should turn most people away, slightly negative publicity may increase interest enough to have positive effects even in the short term. Another factor is whether the review provides reasons that are relevant to the reader. Just as added product features can sometimes have perverse effects and hurt brand choice among consumers who see them as irrelevant to their own interests, reviews that contain irrelevant reasons might also have perverse effects and actually lead to more positive evaluations.

What Now?

Danny felt like he needed to discuss the situation over with his restaurant manager, Jeremy, who was currently at the restaurant. So he hopped on the Light Rail toward Baltimore Avenue and 58th Street. As he opened the door to the office in the back of the restaurant, he saw Jeremy staring at a copy of their wing menu.

"So you've heard about it already, huh?"

"Danny, this is bad. We need to take it down immediately."

"And replace it with what?"

"I don't know, man. A simpler version? Just list a price per wing and that's it."

"You know too well that people often buy large orders for parties and so on, and everyone expects some sort of discount over smaller orders."

"OK, then. What about offering some discounted order sizes, like half-a-dozen, a dozen, etc.?"

"I thought about that. But something tells me we should take advantage of all this attention we're getting."

"But it's bad attention, Danny! People are mocking us!"

"They are, but what if this means more of them will want to come here to see for themselves?"

"Still, it doesn't change the fact that the menu is confusing. Who put this together anyway? The prices make no sense!"

"It was my nephew, Wilson. He said he wanted to help out with the restaurant, so I tasked him with creating this price list."

"Are you kidding me? That kid? No wonder this thing is all messed up. Did he even graduate from high school?"

"Look. There's no point in crying over spilled milk, OK? Let's focus on what we can control."

"Fine. What do we do about the customers who get confused and ask the cashier for an order size that isn't on the menu? Do we expect them to bring a calculator to the store? Julia has come back here several times today asking me how many wings can be bought with $60 bucks. The answer seems to keep changing depending on who comes in the front door."

"You know what? I think you're onto something."

"What do you mean?"

"People are already wondering about our menu prices, right? What if we transform it into a game? A game with prizes!"

"A game? With prizes?"

"For example, we offer some sort of reward to customers who can figure out the question Julia has been bothering you with: for a given amount of money, what's the most wings you can buy?"

"Ah...I see. It could be, say, a free fountain drink!"

"Exactly! And we could also have a prize for figuring out the cheapest way of buying a certain number of wings."

"I think I'm starting to follow. Like at the end of the BuzzFeed article when this Alexander guy asks how much 201 wings would cost. The suggestion by @seanposting was to buy 150 + 45 + 6 wings. That would cost, let me see, $224.25. But is that the cheapest order possible?"

"Correct."

"OK. This is all fine and dandy, but there's a problem. We don't know the answers to these questions either. How can we tell if a customer got the right answer?"

"Good point. I'm still working on that."

Right as Danny finished that sentence, Wilson comes in with loud thumping music leaking out of his headphones.

"What's up fellas!"

Jeremy scoffs at him and turns to Danny "I have another challenge idea."

"What is it?"

"Find me the most annoying way of getting the most wings out of a certain sum of money."

"What do you mean by annoying?"

"Besides Wilson here, it's easy. An order is most annoying if you get to your desired quantity of wings by combining the largest possible number of smaller orders from the order sizes in our menu. For example, I can buy 201 wings with $224.15 by placing 3 smaller orders: 150 wings, then 45, then 6. Could I get 201 wings with the same $224.15 by placing more than 3 orders, and hence annoy the cashier further?"

"You've outdone yourself. I like your enthusiasm. Let's get to work and figure out the answers to these questions. Wilson! Turn that off and help Jeremy out. This is your mess to fix as well."

"Who? Me? What did I do?"

Accompanying Material

The Excel file `wings-data.xlsx` contains a table with Danny's wing menu quantities and prices.

References

[1] Julia Reinstein. This restaurant has the wildest wing pricing structure and people are doing math to try to figure it out. https://www.buzzfeednews.com/article/juliareinstein/that-math-you-said-youd-never-use-in-real-life-is-now-being?bfsource=bbf_enus, 2018. Accessed October 25, 2018.

[2] Jonah Berger, Alan T. Sorensen, and Scott J. Rasmussen. Positive effects of negative publicity: When negative reviews increase sales. *Marketing Science*, 29(5):815–827, 2010.