Instacart Downloads Surge in the Pandemic

1 | Background

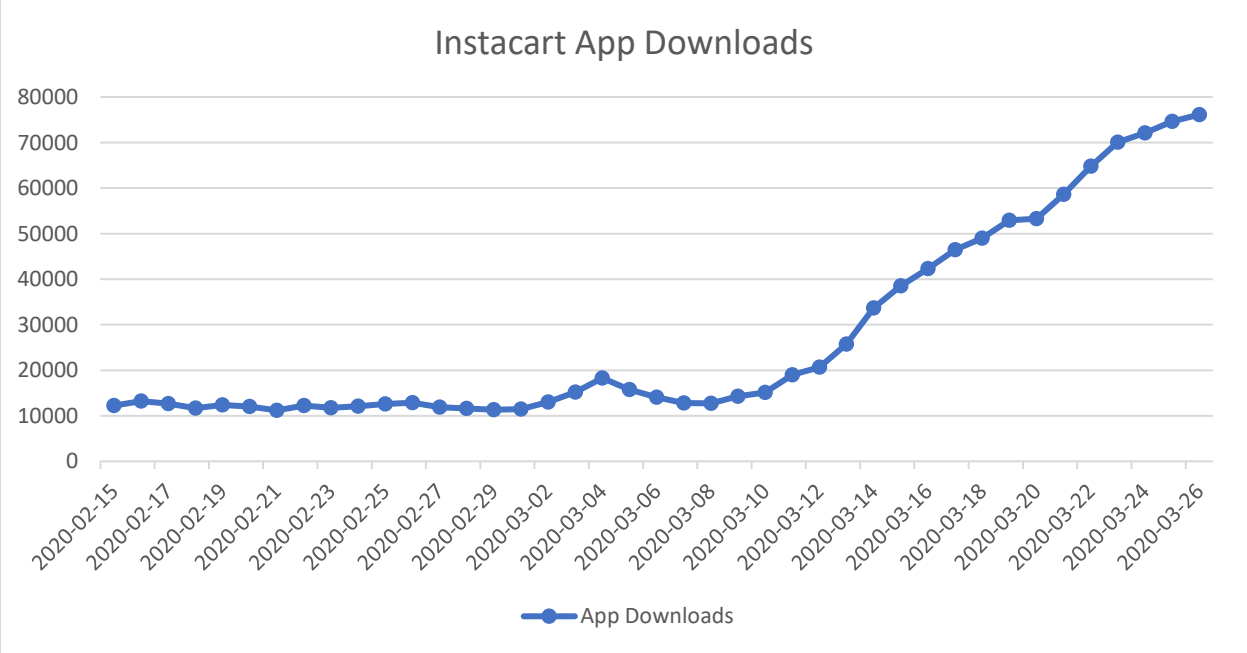
Context

The 2019-present coronavirus pandemic is an ongoing global crisis that has disrupted daily life and resulted in lifestyle changes to reduce the spread of the outbreak. Due to coronavirus being spread primarily through close contact, people are strongly advised to practice social distancing, which is minimizing close contact by staying at home, avoiding crowded gatherings and spaces, and practicing safe greetings (i.e. elbow bumps over handshakes). Citizens of every country affected by this outbreak have been advised to only leave their houses for emergencies or necessities like groceries. Further reinforcing the concern for minimizing close contact, many Americans have turned to delivery services for absolute stay at home measures.

Prior to the coronavirus pandemic, the online grocery market had been sluggish in the United States, making it difficult for online delivery services to suddenly scale up and meet this rapid surge in demand. “Instacart, a platform that partners with more than 25,000 stores in North America, says orders in more recent weeks have surged 150%” (Chan 2020). Therefore, we want to obtain a better understanding of the relationship between the ongoing pandemic and grocery delivery services’ rising demand in regards to human psychology.

Data

This paper explores the number of Instacart app downloads over a 41-day timeline between February 15 and March 26, 2020 (obtained from Apptopia and featured in an article from the Morning Brew):



An obvious driver is the spread of the coronavirus and this paper explores the relationship between Instacart app downloads and the number of reported cases as well as search trends. This dataset includes an estimated U.S. household size of 120,000,000.

Expectations

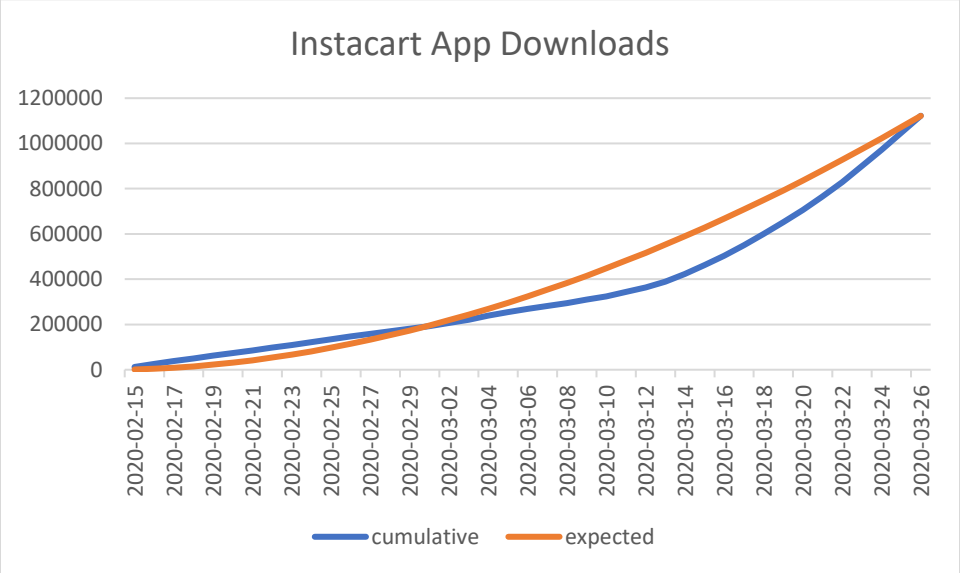
In this paper, we will be investigating the relationship between Instacart app downloads and key drivers. The drivers selected as covariates are as follows:

- Number of U.S. cases on a given day
- Number of World cases on a given day
- Search interest score (0-100) on a given day for ‘coronavirus’ (Google)
- Search interest score (0-100) on a given day for ‘social distancing’ (Google)

We expect the number of U.S. cases on a given day to have the largest impact on Instacart app downloads than the number of World cases on a given day. This is because the availability heuristic holds true where people in the United States will react more seriously to an ongoing crisis that is happening before their eyes than abroad.

2 | Weibull-Gamma Model

We begin with the Weibull-Gamma model, calculating the probability for Instacart App downloads over time. Below is the resulting line graph and model parameters.



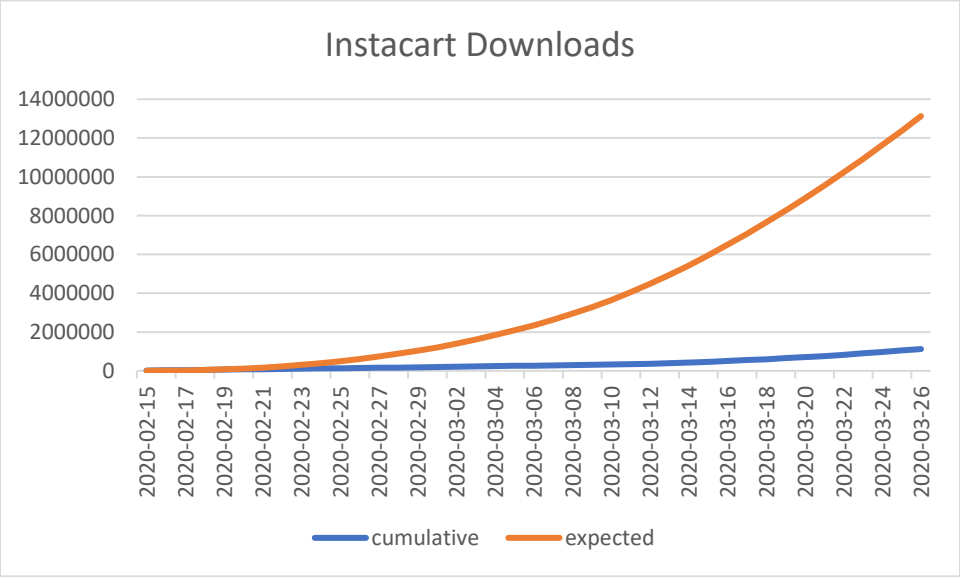
r	*alpha*	*c*	*LL*
61.35802243	6557786.352	1.861174335	-10356077.8

The r and alpha parameters are high for this model, implying a degree of heterogeneity in the data. This is to be expected as the overall population has diverse household needs, financial circumstances, etcetera.

Visually, the model appears to fit decently until March where a slight dip in actual cumulative Instacart App downloads occur. Other contributing factors may be involved in this slight dip.

3 | Weibull-Gamma and Covariates

We then introduce covariates of Google Search trends (coronavirus and social distancing). Below, we see a poorly fitting model where the expected counts far exceed the actual downloads.



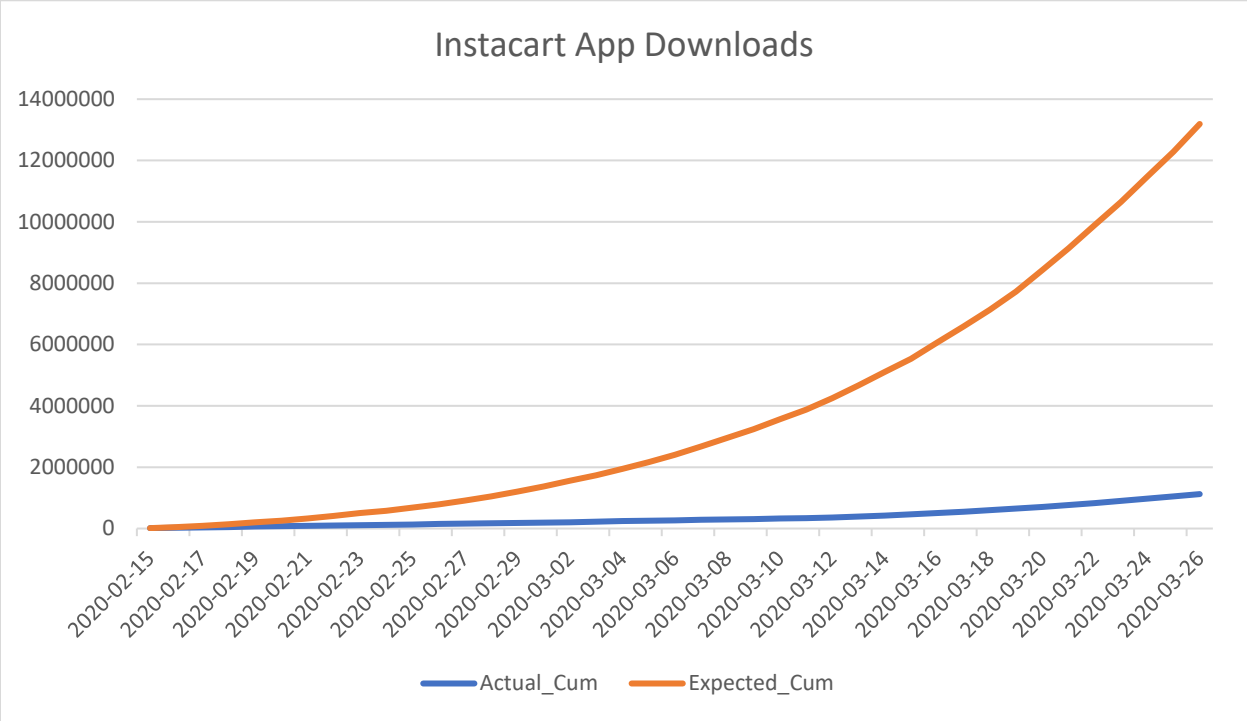
r	*alpha*	*c*	*LL*	*beta Coronavirus*	*beta Social Distancing*
86.503739	6576525.604	2.406956	-96367208.434	0	0.046314

The r and alpha parameters are even higher than the previous Weibull-Gamma model. In addition, c is twice that and the log likelihood is overly small. The beta for coronavirus is virtually zero and the beta for social distancing is also close to zero. Google Search trends for ‘coronavirus’ appears to have virtually no impact on Instacart App downloads while ‘social distancing’ has a small impact. This could be because searches on coronavirus probably focus on reports and articles related to the spread of the outbreak, number of cases, and number of deaths.

Searches on ‘social distancing’ will produce results specific to minimize close-contact interactions and avoiding crowded spaces and public areas. This will more likely ease into the thought of reducing or eliminating trips to the grocery store and lead to interest in online grocery

delivery services like Instacart. Many ‘social distancing’ search results involve articles on how to pursue social distancing and will often suggest online delivery services over in-store shopping.

We then try the covariates relating to number of U.S. cases and number of World cases. Below, we see another poorly fitting model where the expected counts far exceed the actual downloads.



r	*alpha*	*c*	*LL*	*beta US cases*	*beta World cases*
2507.074	267400242.0	1.777	-96139201.915	0	0.309

The r and alpha values are much higher than the previous model. The c parameter is lower than the previous model and the log likelihood is higher. Beta for US cases as a covariate is virtually zero, which is surprising as it refutes the prediction that a concern for increasing nearby cases would lead to more app downloads. The beta for World cases is the most significant out of all the betas, meaning that it is the most significant covariate.

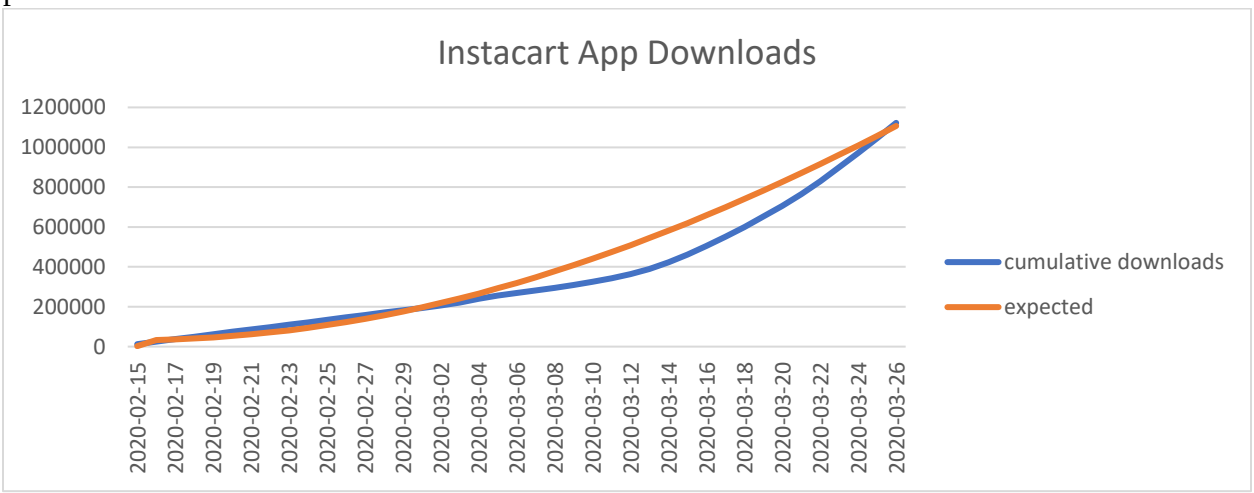
These results could be because the United States has just begun to move towards its peak in coronavirus cases and deaths whereas many other places in the world have already peaked and are flattening/decreasing their curves. In other words, much of the present alarm that is encouraging social distancing stems from observing the coronavirus crisis in the rest of the world. As we near the peak, the number of cases in the US might become a more significant factor to the usage of online delivery services.

The following chart from TalktoMira projects that the United States will reach peak hospital resource use (aka peak in cases and deaths) on April 11, 2020.

In conclusion, social distancing search trends and number of World cases appear to be the only covariates out of the four that have current impact on Instacart App downloads.

4 | Two Segment Weibull-Gamma

We then try the Two Segment Weibull-Gamma model. Below is the resulting line graph and parameters.



r	*alpha*	*c*	*LL*	*pi*
0.047042	10759.4243	2.080908	-10240968.697	0.999738

The r is much smaller in the Two Segment Weibull-Gamma model compared to the previous models. Log likelihood is also slightly higher. The pi value, however, is extremely close to 1 as if the entire population fit into the first segment.

Visually, the Two Segment Weibull-Gamma appears to be the best fit out of all the models.

5 | Conclusions

Using the Weibull-Gamma models, we find it difficult to pinpoint a fitting covariate to predict Instacart App downloads. Google Search trends on ‘coronavirus’ and ‘social distancing’ do not appear to have much effect at all on accurately modeling expected downloads. This could be because those terms are too vague to connect to online grocery delivery apps. Should Instacart choose to invest in SEO keywords, they would probably be better off investing in more specific niche terms, such as ‘online grocery’ and ‘how to order groceries online’, which have extremely high Google Search Trend scores and are more relevant. (See Appendix)

Additionally, the greater significance of number of World cases compared to US cases could be a sign that the US has yet to reach its peak in terms of cases, hospital resource exhaustion, and deaths. Newer data on the coronavirus as we draw nearer to April 11 will probably show higher significance of US cases to online grocery apps.

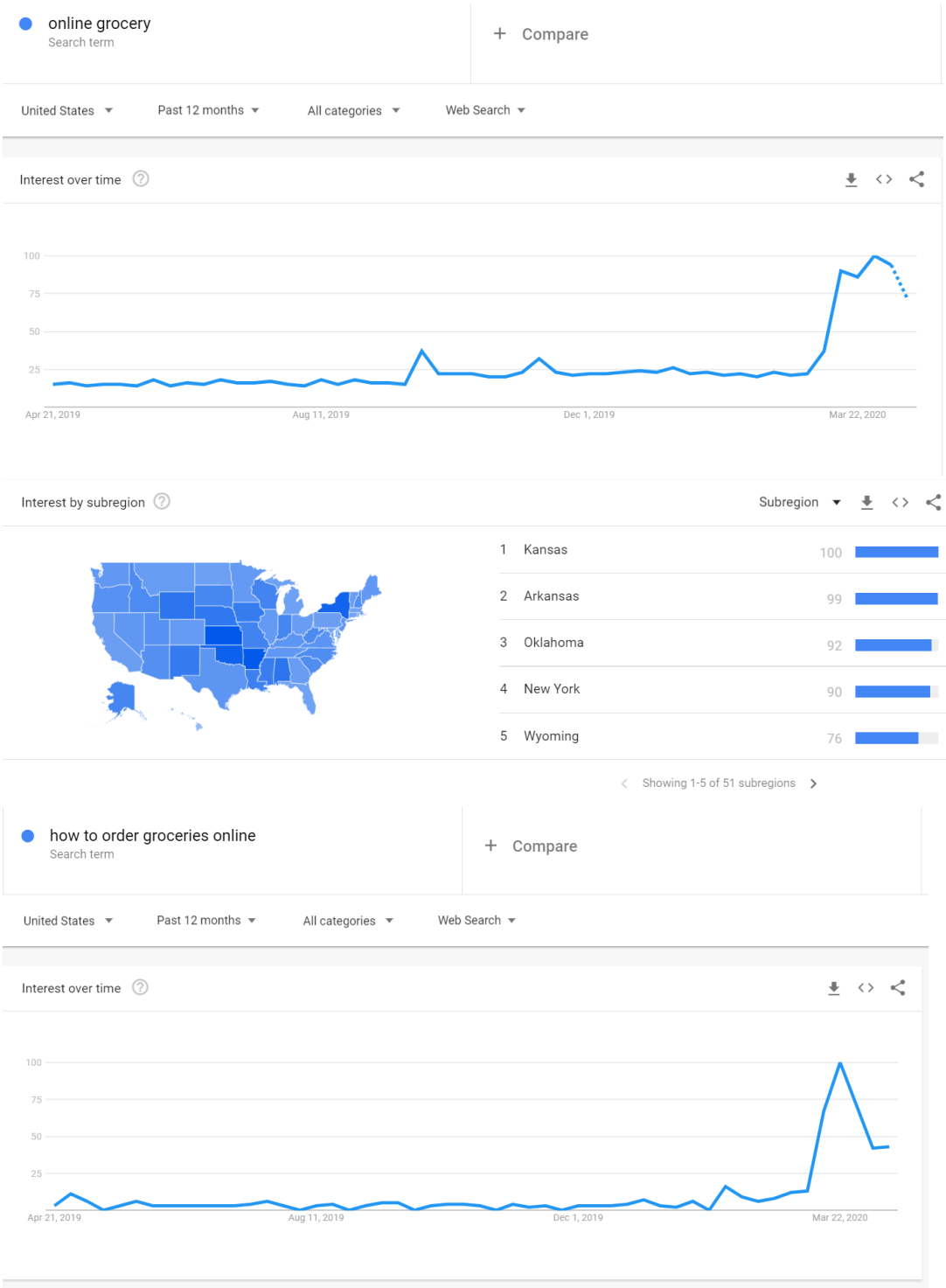
In conclusion, Instacart should invest in SEO keywords relating specifically to online groceries and delivery services as there is undoubtedly interest and overwhelming demand. Further breakdowns of what age group, gender, and regions are searching up these keywords would allow better ad targeting and expansion initiatives to reach interested customer segments.

6 | Shortcomings and Insights

The selected covariates from Google Search Trends were not the best due to looser ties to online grocery delivery services. Data on number of deaths rather than cases may be a better covariate to use as increasing number of deaths will have a greater psychological impact than number of cases. Fear associated with high numbers of death would more heavily reinforce social distancing measures and convert people into relying on delivery services to avoid leaving their homes. Analysis on search trends directly addressing online grocers would have probably produced better models and projections as well.

-- Appendix

Below are Google Search Trend results that would have been better to explore with the given dataset on Instacart App downloads.



-- Works Cited

Chan, Kelvin. “Grocery Delivery Services Struggle to Keep Up With Demand.” *Time*, Time, 7 Apr. 2020, time.com/5816695/grocery-delivery-services-coronavirus/.

Vuong, Khang T., et al. “When Will Coronavirus Peak & End - Data From 50 U.S. States.” *RSS*, Mira, 13 Apr. 2020, www.talktomira.com/post/when-will-coronavirus-peak-and-end-social-distancing.