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Context analysis of fast-food visits: exposure and effect of urban environments

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OVERVIEW

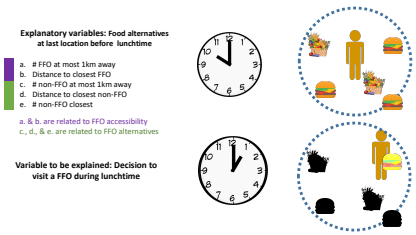
Purpose: Research linking food environments to diet and disease has generated mixed findings. A limitation is the sparse information on food environments people are exposed to daily. In this work we leverage mobility data to study peoples' visits to food outlets beyond their neighborhood, and how food outlet choice is linked to features of the food environments people are exposed to.

Conclusions: These findings indicate that decisions to visit FFOs are shaped by the relative availability of fast-food and non-fast-food outlet options in the environments people are exposed to daily.

METHODS

Data: Our data consists of GDPR compliant location data for 1.7M users during 6 months in 11 cities in the US.

Our goal is to measure whether variables related to accessibility of alternatives to FFO affect the decision to visit a FFO. We do 3 studies focused on evaluating choices to visit a FFO during midday, given the food outlet alternatives in the surrounding food environment in the last non-food location before midday. All studies included only people/day pairs who had a FFO at most 1km away in their last location before midday, and our interest is seeing when the FFO was rejected v accepted.

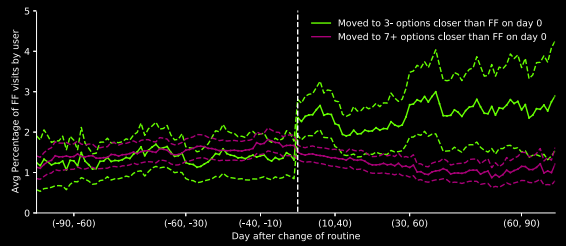


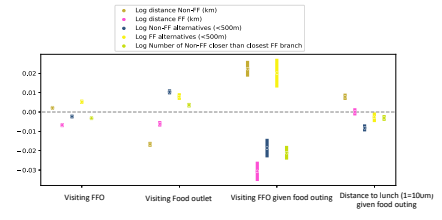
STUDIES AND RESULTS

Study 1 Baseline

What features of the food environment determine the decision to visit a FFO. We made a database of the last non-food related stay where users were observed between 9h00 and 11h30. From this stay we determined the food environment to which everyone was exposed before lunchtime. Then we defined whether an outlet was visited as *the first food outing started after 11h45 and before 14h*. Then we ran a fixed effect model which explained visits to FFO with features of the food environment. The results are in last column.

In urban food environments, peoples' visits to fast food outlets greatly increased when other food alternatives are lacking, based on large-scale mobility data.





Coefficients with 95% CI for the explanatory variables explaining 4 different outcome variables. 3 regressions were ran, one with distance variables, one with absolute count variables and one with the comparative count variable.

Finding We observe that accessibility of alternatives carry a weight close to half of the one carried by accessibility of FFO when deciding whether to visit a FFO. Less alternatives are related with more total visits to a FFO, and less total visits to food outlets

Study 2 Daily life medium-term effects

We assess the persistence of the relationship. We study people who moved their daily context from one place to another during the study and divide them between the ones who went to higher accessibility of fast food alternatives and those who went to lower. Then we can see whether each group changed their visits to FFO according to the new environment and compare it to their visits before changing environment.

The plot in the central section shows visits of people who moved from a place which originally had at least 7 alternatives closer than any FFO (95% CI assuming normality). We see that the group of people who moved to places with less non-FF alternatives approximately doubled their original percentage of visits to FFO.

Study 3: Natural semi-experiment

We sought a variation in the food environment as exogenous and random with respect to food preference as possible. We studied visits to the RMVs and DMVs, where driving licenses are issued. The food environment is close to random as availability of appointments and comfortable distance to house/workplace can be very restrictive. Then we related the features of the RMV environment to the decision to visit a FFO later in the day.

Dependent variable	FF during RMV	FFO visit after RMV	FFO visit after RMV	FFO visit after RMV	FFO visit after RMV
Mean visits to FF 2 weeks before visit rmv	0.253*** (0.018)				0.251*** (0.018)
Constant	0.026*** (0.002)	0.056*** (0.002)	0.105*** (0.013)	0.079*** (0.015)	0.06*** (0.015)
log(# Food outlets closer than all FFO)		-0.008*** (0.001)		-0.007*** (0.002)	-0.006*** (0.002)
log(minimum distance to FFO)			-0.011*** (0.002)	-0.005 (0.003)	-0.005 (0.003)
rsq	0.024	0.002	0.001	0.002	0.026
N	22917	22917	22917	22917	22917

The table shows the coefficients for food environment features on a series of regressions explaining the decision to visit a FFO after going to the RMV. We also control for people's propensity to visit FF by adding the mean daily visits to FFO before the RMV day.

DISCUSSION

Our 3 studies results suggest daytime visits to FFO are driven not only by accessibility to FFO, but also by lack of alternatives. This means that under a fixed accessibility to FFO, less alternatives means more visits to FFO. This answers the question: **if alternatives to FFO around work are removed, do people bring their own lunch from home? Or do we switch to more visits to FFO. The answer is a combination of both, and we do see evidence for increased visits to FFO**. Moreover, the relationship lasts at least 3 months in a new environment and seems to be causal under some circumstances. This has implications for public health policy and urban planning.