Econ 196
Topic: Applied Micro/Development

The Health Impact of *Oportunidades*

Introduction

Oportunidades is a successful Mexican anti-poverty program that has been used as a model for similar programs worldwide. The program takes a novel approach to fighting poverty by essentially paying families to make good health and educational decisions. Numerous studies have shown that the program does promote health and educational improvements among participants. However, a recent series of studies by Fernald, Gertler, and Hou find that the more money families receive, the worse the health of adults, relative to participant families who receive less cash. In contrast, the opposite is true for the health of children. Focusing on the health component of *Oportunidades*, this paper provides an economic explanation for this empirical finding.

Initiated in 1997 under the name *Progresa,* the program targets Mexican families below the poverty line, offering monetary incentives for health and educational gains. The goal is to encourage poor families to invest in human capital and alleviate the effects of poverty by way of cash transfers. Participant families receive money from the government every month, conditional on keeping their children in school, getting biannual check-ups at clinics, and having adult members of the family attend regular health seminars.

Empirically, *Oportunidades* has largely been deemed a success. Nigenda (2005) details a laundry list of positive health outcomes, including a fivefold increase in preventive consultations, decreased maternal and infant mortality, lower disease incidence in younger children, and reduced infant malnutrition, among others. Gutierrez, et al (2004) find a 20 percent reduction in days of reported illness among adults. Finally, Fernald, Gertler, and Hou (henceforth FGH) (2008a) report that the program reduces adult obesity and hypertension and increases self-reported adult health.

However, these results are subject to one important qualification. A second study by FGH (2008b) finds that increasing the amount of cash is correlated with *worse* health outcomes for adults (higher BMI and increased prevalence of hypertension and obesity), while the *opposite* is true for children. Thus, cash transfers, while intended to function as incentives for positive health gains, seem to carry unforeseen negative health outcomes but only for a certain age group. FGH speculate briefly on a few explanations for these findings, but perhaps the most cogent story is that with the cash they receive, adults purchase more unhealthy food for themselves but not for their children. Unfortunately, they do not have the data to confirm this hypothesis. Our goal is to flesh out the economic story behind this explanation.

The first section of this paper reviews in more detail the studies by FGH. The second section presents a simple intertemporal model of dieting in which an agent must decide between junk food and healthy food, facing an income stream each period. Junk food carries future health costs, which are time-discounted. The costs are further discounted to capture the role of information. Our main interests are the effects of cash transfers, improved information from program participation, and future discounting on dieting. We highlight the tension between the income effect from increased cash flows and the effect of improving information and note how future discounting can strengthen the former while weakening the latter. The combination of these factors evidently drives the health outcomes observed by FGH. The third section considers why parents may curtail child junk food consumption without restricting their own. Parents face a trade-off between maximizing a child's immediate desire for unhealthy food and the child's long-term health. Proposing several models of parental decision-making, we analyze how parents may respond to this trade-off in different ways. We also discuss the plausibility of each model, given the findings by FGH. Section four concludes.

1. Background and Empirical Findings

Oportunidades was initiated to address the twin problems of unequal distribution of income in Mexico and the resulting generational poverty trap that plagues much of its population. In 2002, half the Mexican population was living in poverty, 20 percent in extreme poverty (World Bank 2009). Meanwhile, 42 percent of the country's wealth was concentrated in the richest 10 percent of the population (Nigenda 2005). Consequently, there existed then and still exists today a huge disparity in disease incidence between the rich and poor. For the wealthy, the disease burden is similar to industrialized nations, but for the impoverished, it is similar to underdeveloped nations (Nigenda 2005).

Against this background, *Oportunidades* takes a novel approach by not only redistributing money to the poor but by conditioning transfers on positive educational and health behavior, thereby addressing both income inequality and disparate disease incidence simultaneously (in addition to educational disparities). Specifically, participating families receive grants per child for keeping her or him in school, and the grants increase as the child progresses to higher grade levels. The amounts range from around $10 to $60 a month. A fixed amount of cash is also provided to each family, about $25 per month, as well as a free basic health care package and nutritional supplements for children. Moreover, the cash transfers are contingent on families visiting public health clinics for biannual check-ups and adult attendance of health and hygiene seminars. It is worth mentioning that less than 1 percent of the population was denied benefits due to noncompliance (Fernald, Gertler, and Hou 2008b).

We now summarize three studies that analyze the health consequences of the program. One study by Fernald, Gertler, and Hou (FGH) (2008a) compares the health of program participants to similar nonparticipants based on a variety of health measures. When *Oportunidades* was initiated in 1997, there was a survey of rural communities in seven states, and eligible areas were randomly distributed into participant and control groups. The participant group began receiving benefits in April 1998, and in November 1999, the control group began receiving benefits as well. In 2003, a new survey led to the addition of a new control group. FGH compare a sample of adults from the both the 1998 and 1999 participant groups against a sample from the 2003 control group, using survey data on all the groups from 2003. They find modest mean reductions in body mass index (BMI)—a 2.2 percent difference between groups, which, while insignificant at the individual level (clinically significant weight loss is a 5-10 percent reduction in weight), is significant at the aggregate level. There are large reductions in the percentage of obese participants (20.28 versus 25.31) and the percentage overweight (59.24 versus 63.04). They also find reductions in systolic blood pressure (SBP) and diastolic blood pressure (DBP) of 1-3 percent.

A second study by FGH (2008b) attempts to disentangle the effects of the cash transfer component from the effects of seminar attendance and clinical appointments. FGH compare the 1998 group against the 1999 group. Due to the 18 month time delay, the former group naturally received a larger total amount of cash. The study finds that doubling the cumulative cash transfer is *positively* correlated with higher BMI ($\beta = 0.83$, $P < 0.0001$), higher DBP ($\beta = 1.19$, $P = 0.03$), higher SBP (β = 0.25, P = 0.25), and statistically significant increases in the prevalence of overweight and obesity (odds ratio 1.41 for both with respect to grade I obesity, and 1.57 for grade II obesity), for a sample of adult males and females. That is, the more cash that families receive both from being in the program longer and/or from having more children in higher grade levels, the worse the health outcome relative to participating families that have received less cash. FGH rule out the possibility that these results are due to differences in the length of program participation, finding that longer program participation is associated with positive health outcomes, though many of the differences are statistically insignificant.

In contrast, Fernald, Gertler, and Neufeld (2008) find that doubling the cumulative cash transfer is associated with positive health outcomes for children, including lower BMI for each age percentile and lower prevalence of overweight. Thus, while cash transfers are beneficial for children, they are detrimental for adults. It should be noted that by "detrimental" we mean relative to participants who receive less cash; participants, regardless of the amount of cash received, still do better than nonparticipants.

FGH briefly speculate on two main explanations. First, adults may be using their new income to purchase more unhealthy food items for themselves but not for their children. Since items such as junk food, tobacco, and alcohol are normal goods, this is plausible for adults; FGH note that a higher socio-economic status for low-income individuals in Mexico is correlated with higher rates of obesity. A short-term impact study of *Oportunidades* found that households from the 1998 group consumed 7.1 percent more total daily energy than the 1999 group, which FGH argue indicates that much of the cash transfer goes towards purchasing additional food (FGH 2008c). However, this does not explain why children would see health improvements given higher caloric availability. They also speculate that parents may simply wish to curtail excessive consumption on the part of their children, but then it is unclear why parents would indulge substantially, while refusing the opportunity for their children. Due to lack of data, FGH are unable to provide any more detailed empirical analyses.

Their other explanation is that the cyclical nature of the flow of cash transfers leads to boom-and-bust cycles of consumptions. When households receive their money, food is abundant for a few weeks but less so afterwards, which may influence consumption patterns. Recipients, in this case adult participants only, may be inclined towards binge eating during plentiful periods and become malnourished in subsequent periods, which is cycle that can lead to long-term weight gain. This has been fielded as an explanation for why an empirical study of the US Food Stamp Program in the 1990s links participation with higher body weight for women but strangely not men or children (Ralston and Van Ploeg 2008). FGH unfortunately have no data to support this hypothesis. Moreover, it is unclear why adults in general would be susceptible to cyclical consumption under *Oportunidades*, yet only women were susceptible under the Food Stamp Program.

The latter explanation seems unconvincing to us, while we believe the income explanation has a clean economic story behind it. We aim to provide a model of food consumption that more clearly articulates the income story and clarifies the following questions. Why would adults engage in unhealthy consumption patterns if they are attending health seminars? Why might adults overconsume, yet prevent their children from doing so?

2. Junk Food Consumption

Oportunidades aims to improve health among the poor both by making medical treatment available to them and by preventing disease by encouraging healthy behavior, the latter of which is our primary focus.[1] The key way in which the mandatory health seminars and check-ups required by *Oportunidades* promote healthy behavior is through the dissemination of health information. Health seminars give program participants better general knowledge about, say, a good diet and the proper amount of exercise, while check-ups enable physicians to communicate more specific health information tailored to the particularities of the individual patient. Because the poor are unlikely to be well informed about the benefits of exercise and a healthy diet, one would expect that having better knowledge of the costs and benefits of their behavior would enable them to make healthier decisions about their lives. We explain the effects of disseminating health information by considering a simple model of junk food consumption.

The key decision-making problem for the agent is weighing the future health costs of junk food against the immediate pleasure it yields. A rational model of intertemporal decision-making assumes a utility function with hyperbolic discounting of the form

[1] One might argue that ignoring the former effect is problematic because free health care could create a moral hazard by encouraging unhealthy behavior, the costs of which won't be born by the participant, thus encouraging junk food consumption. We do not consider this to be a key part of the empirical story, since it does not explain why child health improves with higher income, nor why adult health still improves relative to nonparticipants.

$$U_t = u_t + \sum_{\tau=t+1}^{T-t} \delta^{\tau} u_{t+\tau} \text{ where } \delta \in [0,1] \qquad (1)$$

That is, the agent maximizes utility across all time periods by discounting future utility according to δ. This captures the tendency of people to treat the present as more important than the future. Thus, when faced with an activity that yields benefits in the current period but comes at a price of future costs, the agent will weigh the present benefits against the present-discounted value of future costs.

We now propose a more specific form for the utility function. Let j be the quantity of "junk" food consumed and h the quantity of "healthy" food consumed. What distinguishes the former from the latter is that junk food carries a health cost in the subsequent period, c times a function of junk food consumed. To capture imperfect information about health costs, we discount the health cost by a factor θ, where $\theta \in [0,1]$. Thus, the agent *perceives* a health cost of θc, when the "true" health cost is c. Also, we denote the taste ratio of junk food to healthy food as α. The agent's present utility at time t will then take the following form:

$$U_t = (\alpha \log j_t + \log h_t) + \sum_{\tau=t+1}^{T-t} \delta^{\tau} (\alpha \log j_{\tau} + \log h_{\tau} - \theta c \log j_{\tau-1})$$

We assume health costs rise logarithmically with consumption to simplify the math later. We also assume a budget constraint $pj_t + h_t = M_t$ for each period t, where p is the price ratio of junk food to healthy food. We assume no savings and interpret M as the monthly cash transfer from *Oportunidades*. With this setup, the problem can be collapsed into a constrained maximization problem for a particular period t:

$$\max_{j_t, h_t} \alpha \log j_t + \log h_t - \delta \theta c \log j_t \qquad \text{subject to} \qquad pj_t + h_t = M_t$$

if we normalize δ to one. We drop the t subscripts henceforth for notational simplicity. Solving the Lagrangean, we obtain our optimal consumption basket $j^* = \dfrac{M(\alpha - \delta\theta c)}{p(\alpha - \delta\theta c + 1)}$ and $h^* = \dfrac{M}{\alpha - \delta\theta c + 1}$ for any particular period.

Note that j^* is positive when $\alpha > \delta\theta c$, or when the taste ratio exceeds the discounted cost. We will assume $\alpha > \delta\theta c$ so that we have nontrivial results and also because the fact that many people actually do consume junk food suggests that this inequality should be binding. Also notice the agent consumes more junk food than healthy food when $\alpha - p > \delta\theta c$, or when the taste-price differential is greater than the discounted cost. Health policy thus has two avenues for encouraging substitution towards healthy food: either increasing the price through taxation or improving knowledge of the health cost by increasing θ. We will consider the effect of the latter approach, which is taken by *Oportunidades*.

Determining the impact of θ on j^* is a simple comparative statics exercise. We calculate $\frac{\partial j^*}{\partial \theta} = \frac{-Mp\delta c}{p^2(\alpha - \delta\theta c + 1)^2}$ which is evidently negative. The notion of being more informed is captured by an increasing θ; the closer θ is to one, the more informed the agent about the health cost of junk food. Intuitively, the more informed the agent is about the cost, the lower is the agent's consumption of junk food, so it makes sense for this information effect to be negative for junk food. On the other hand, this effect is positive for healthy food: $\frac{\partial h^*}{\partial \theta} = \frac{M\delta c}{(\alpha - \delta\theta c + 1)^2} > 0$. The result of improving information is then a substitution effect from junk food to its healthier alternative.

Off-setting the benefits of health seminars and check-ups is the effect of increasing income. Since $\alpha > \delta\theta c$, we have that both $\frac{\partial j^*}{\partial M}$ and $\frac{\partial h^*}{\partial M}$ are positive, which implies that one should expect increases in transfers to result in increased purchases of both goods. This is the standard income effect for the case of normal goods. Hence, cash transfers, while acting as an important incentive, have the unintended consequence of adversely impacting health. The ultimate health impact of *Oportunidades* is thus determined by the magnitudes of the income and information effects.

Because the agent's decision-making problem is intertemporal, it is natural to determine the effect of future discounting on consumption. It is easy to see that $\frac{\partial j^*}{\partial \delta} = \frac{-Mp\theta c}{p^2(\alpha - \delta\theta c + 1)^2} < 0$. A greater degree of future discounting is captured by a lower δ, so consumption increases with myopia. This is intuitive, since the future cost of behavior is reduced by future discounting, making greater consumption optimal. This discounting also influences the magnitudes of the information and income effects. Consider $\frac{\partial j^{*2}}{\partial \theta \partial \delta}$. Some calculus shows that this expression is negative, which implies that as δ *decreases*, $\frac{\partial j^*}{\partial \theta}$ becomes less negative. That is, more future discounting lowers the absolute value of the information effect, counteracting the gains from improved information. Moreover, $\frac{\partial j^{*2}}{\partial M \partial \delta} = \frac{-p\theta c}{p^2(\alpha - \beta\theta c + 1)^2} < 0$, so decreasing δ increases the magnitude of $\frac{\partial j^*}{\partial M}$. This implies that future discounting exacerbates the income effect.

This is an important implication for a policy that seeks to increase the availability of health information in order to promote healthy behavior. We determined above that greater future discounting worsens the income side-effect of the program, while reducing its main benefits for healthy dieting. The same result could hold for maximizing the amount a person exercises, exercise being a consumable that yields future benefits but carries immediate costs, rather than immediate benefits at future cost, as with junk food. An overweight person being told the importance of exercising still often finds it difficult to commit herself to an exercise program precisely because the present costs loom larger than the future benefits. Hence, in maximizing health information, the government partly aims to improve welfare by pushing all agents' perceived health costs (or benefits, for the case of exercise) closer to their true health costs, but the effectiveness of this policy depends a great deal on the degree to which individuals discount the future.

To answer the first question we pose above, then, adults engage in unhealthy consumption patterns while simultaneously attending health seminars because higher income leads to increased junk food purchases if individuals have sufficient taste for junk food, this despite the countervailing effects of improving health information. Moreover, future discounting both mitigates the effect of better health information and exacerbates the effect of higher income on junk food consumption. It is also theoretically possible that either the program fails to change θ by any significant amount or that even under a value of $\theta = 1$, the agent may find it optimal to consume harmful amounts due to extreme myopia. The empirical data, however, tends to rule such explanations out, given that program participation does produce aggregate health gains relative to nonparticipation. The question persists, however, why these same effects do not seem to hold for children.

3. Parenting

FGH find that adult health decreases with income but child health increases. This section considers several explanations for this finding and discusses their plausibility in light of the empirical data.

We assume parents act more or less altruistically towards children, whether out of genuine affection or because they view their children as investment vehicles. More formally, we suppose parent utility is an increasing linear function of *perceived* child utility, $U_t^P = \phi U_t^C + \sigma$, where $\phi \geq 0$ is the degree of altruism and σ denotes other arguments for parent utility. The superscripts C and P distinguish between child and parent parameters. Thus, for our food consumption model, the parent ultimately maximizes the complicated expression

$$\max_{j_t^C, h_t^C, j_t^P, h_t^P} U_t^P = \phi(\alpha^C \log j_t^C + \log h_t^C - \delta^C \theta^C \varsigma^C \log j_t^C) + (\alpha^P \log j_t^P + \log h_t^P - \delta^P \theta^P \varsigma^p \log j_t^P)$$

subject to $pj_t^C + h_t^C + pj_t^P + h_t^P = M_t$.

The child and parent parameters have the same restrictions as the model in section three. The health cost (formerly denoted c) is denoted ς to avoid confusion with superscript C. In this model, the parent receives utility from the child being fed (U_t^P increases with j_t^C and h_t^C), and the child's tastes are important to the parent: that is, if the child has a taste for junk food, the parent wishes to satiate it, rather than exclusively purchase healthy food ($\alpha^C > \delta^C \theta^C \varsigma^C$ implies $j_t^C > 0$, like in section three).

Additionally, we interpret the parameters α^C, δ^C, and θ^C as what the parent may *perceive*, since the parent does not have perfect knowledge of the child's preferences. What knowledge she does possess should usually reasonably approximate the child's true parameters, given the information the child communicates directly to the parent (through, say, pestering) and any outside information the parent may receive (health seminars). However, here we allow θ^C to be greater than one to capture overprotectiveness in the sense that the parent might entirely overestimate the health costs. Under this setup, we field three possible reasons a parent might consume more junk food than she allows her child.

First, a child may simply dislike junk food, i.e. $\alpha^C < \delta^C \theta^C \varsigma^C$. This would be possible if the child lacks a taste for junk food, doesn't discount the future much, possesses near-perfect information about the health costs, and/or simply has low health costs. These seem to be unlikely postulates for obvious reasons, certainly unlikely in the aggregate. Moreover, under this scenario, improving information should have no impact on child health. Since FGH do find improvements in child health due to program participation, it is unlikely that health seminars and check-ups played no role in these changes.

Second, the parent might be selfish. If we simplify by letting $\alpha^C = \alpha^P$ and $\delta^C = \delta^P$, when $0 < \phi < 1$, it is easy to see that $j_t^C < j_t^P$ at the optimum because the utility the parent gains from the child's consumption of junk food is less than the gain from the parent's own consumption, due to the discount factor ϕ. Thus, even if the child has a taste for junk food, the parent would prefer to allocate more of the family income stream towards her own consumption of junk food. Essentially, ϕ mitigates the income effect on child consumption of junk food. It may be plausible that some parental selfishness could contribute to the empirical discrepancy between changes in child health and changes in adult health.

Third, the parent may perceive the health costs to be higher for her child. Hold $\alpha^C = \alpha^P$, $\delta^C = \delta^P$, and $\phi = 1$, for simplicity. If $\theta^C \varsigma^C > \theta^P \varsigma^P$, it is then optimal to distribute less junk food to the child than the parent. This can be the case if the parent is "overprotective" ($\theta^C > 1$), or the child is more genetically susceptible to obesity ($\varsigma^C > \varsigma^P$), both of which are certainly plausible. In general, however, we would be inclined to believe that the cost for the child $\theta^C \varsigma^C$ should not be seen as too radically different from the cost for the parent $\theta^P \varsigma^P$, in light of having improved health knowledge from program participation. We believe it is unlikely that parents would form the belief that somehow they would be much less affected by the serious health risks they believe threaten their children. We doubt that parents in the aggregate would fail to significantly revise their own health costs upwards, if they believe substantial costs exist for their children. We would posit, then, that $|\theta^P - \theta^C| < \varepsilon$ to suggest that a parent's information about her own health costs should always be close to her information about her child's health costs, since it seems likely that they would approximately increase or decrease together. In short, parental overprotectiveness or ignorance towards their own health costs do not seem the most plausible explanations for the health discrepancies.

However, a sense of "protectiveness" can be captured differently by a model that departs from rational time-consistency. Consider an alternative model of utility:

$$U_t = u_t + \beta \sum_{\tau=t+1}^{T-t} \delta^{\tau} u_{t+\tau} \text{ where } \delta \in [0,1] \text{ and } \beta \in [0,1] \qquad (2)$$

In the case of $\beta = 1$, this model reduces to the time-consistent case. Total myopia is captured by $\beta = 0$. Here, the relative discounting between periods $t+k$ and $t+k+1$ is less than the discounting between today (time t) and tomorrow (time $t+1$) due to the β coefficient. This makes it possible for an agent at time t to decide that the cost of consumption born at time $t+k+1$ is not worth the benefit of consumption at time $t+k$ and yet still consume once $t+k$ becomes today. This is the model of time-inconsistency common in the behavioral literature.

For our junk food model, the maximization problem is virtually the same: $U_t = (\alpha \log j_t + \log h_t) + \beta \sum_{\tau=t+1}^{T-t} \delta^{\tau} (\alpha \log j_{\tau} + \log h_{\tau} - \theta c \log j_{\tau-1})$ subject to the budget constraint, the difference being the extra β coefficient. It is immediate that the comparative statics results for the effect of the β coefficient on consumption are essentially identical to those with respect to δ (simply replace δ with $\beta\delta$). For certain parameter values, however, the models differ with respect to attitudes towards future consumption. Consider values such that for a particular period t, $\alpha < \delta\theta c$ but $\alpha > \beta\delta\theta c$. In the former case, the parent would not consume junk food, but in the latter she would, as explained in section three. Thus, under the assumption of time-inconsistency, the parent's "self t" would consume in period t. Consider, however, self t's attitude towards consumption in period $t+k$. Since β-discounting only occurs between period t and $t+1$, self t would notice that at time $t+k$, we have $\alpha < \delta\theta c$ and therefore she would consider junk food consumption in that period suboptimal. Yet, once time $t+k$ becomes the present, self $t+k$ would again choose to consume, since $\alpha > \beta\delta\theta c$. Hence, an agent might realize that junk food consumption is harmful on net, yet still choose to consume anyway, due to the lack of self-control, as captured by β.

How might such a parent choose to maximize her child's utility? At the extremes, an altruistic parent can choose either to maximize her child's immediate pleasure or the child's long-term welfare. In the former case, the time-inconsistent parent is short-sighted with respect to child welfare: she maximizes time-inconsistent child utility according to equation (2) and discounts child health costs by β, thus allowing the child to consume every period. (We implicitly assume here that children are time-inconsistent and privilege immediate pleasure over long-term well being. This isn't much of a stretch.) But in the latter case, the parent, concerned about her child's overall well being rather than simply the child's present need for gratification, does not β-discount the child's health costs and may end up curtailing junk food consumption. Suppose the agent is time-inconsistent, maximizing her own consumption according to equation (2), but maximizes *time-consistent* child utility. Again, hold $\alpha^C = \alpha^P$, $\delta^C = \delta^P$, and □ = *1*. Then for parameter values such that $\alpha < \delta\theta c$ and $\alpha > \beta\delta\theta c$, the parent will consume positive amounts of junk food every period but forbid the child from consuming any. That is, the parent views her child's consumption as she would view her own future consumption; she would notice that in future periods, $\alpha < \delta\theta c$ and hence would not consume. This is the calculation she performs for her child. Yet, the parent lacks self-control when it comes to her own dieting decisions because $\alpha > \beta\delta\theta c$ and thus does consume junk food. In short, *the parent is better at saying than doing*. Thus, while the effects of improved information can be severely mitigated for the parent due to β-discounting, it may still encourage the parent to better her child's diet if $\alpha < \delta\theta c$, which explains why child health can improve with income while adult health declines.

4. Conclusion

This paper explains the results of empirical work concerning changes in child and adult health under the program *Oportunidades*. We first show why adult health might decline with income, despite the benefits of improved information about the health costs of their behavior. The key problem is that higher income leads to the greater purchasing of junk food, so the incentive scheme of the program results in unforeseen reductions in health. Moreover, if the poor significantly discount the future, this may mitigate the program goal of improved information about health costs. We also present several explanations for why child health improves with income. Under a time-consistent model, we suggest child tastes, parental selfishness, and overprotectiveness as possibilities, concluding that selfishness seems most plausible given the FGH results. Additionally, we suggest a behavioral modification to the model and propose that parents may lack self-control when it comes to their own diets but have no such behavioral constraint when planning their children's diets. The main contribution is the pinpointing of several key phenomena that seem to drive the empirical results. This knowledge may help suggest possible improvements to the incentive scheme of *Oportunidades*.

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