

## The Atkins' diet: an economic perspective

By Jason Somerville

*Junior Sophister*

somervj@tcd.ie

*This essay attempts to expose the economic rationale behind the Atkins' diet, one of many fad diets which claim to have discovered the secret to rapid and lasting weight-loss. Jason Somerville compares the effect which the Atkins' diet and traditional diets have on the utility of the participant, each restricting carbohydrates and calories respectively. He discovers that although both diets generate the same results in terms of weight-loss, there is a significant difference in terms of utility levels. Furthermore, the fact that Somerville reveals the Atkins' diet to be much less novel than it purports to be has significant implications for the booming diet industry.*

### Introduction

What is the secret to weight loss? One answer has been put forward by Dr Robert Atkins. First popularised by his 1972 book entitled 'Dr. Atkins' Diet Revolution,' it has since sold over 45 million copies worldwide (Astrup et al., 2004). The central premise of the diet is that by restricting the intake of carbohydrates, the body's metabolism switches from burning glucose as a primary energy source to burning fats instead (Atkins, 1972). In turn this leads to fast and effective weight loss. There is a limited degree of scientific explanation behind this assertion. The process of metabolic change described by Dr Atkins (1972) is known as ketosis. It begins when insulin levels are low, and so by restricting the intake of carbohydrates, the body produces less glucose, thereby ensuring insulin levels remain muted. Unlike conventional diets, the Atkins' Diet does not set limits on the amount of calories one consumes. While Dr Atkins did later clarify that his diet is not a licence to gorge<sup>1</sup>, no restrictions are set on calorie intake. It is the process of ketosis and not calorie restriction that facilitates weight loss.

Dr. Atkins' diet contradicts the assertions of economic theory. If you ask an economist how to reduce a person's weight, the answer will be straight forward: constrain a person's endowment of calories forcing them to consume at a new Pareto

---

<sup>1</sup> <http://news.bbc.co.uk/2/hi/health/3408931.stm>

efficient level. In essence, this is the view backed by ‘traditional’ diets. However, by not constraining calorie intake, the Atkins diet should not be effective at reducing weight. There is one problem with this prediction; it contradicts a vast body of empirical evidence. There have been a considerable number of experimental findings indicating that weight loss is equivalent for those on the Atkins’ diet when compared with more ‘traditional’ diets (Truby et al., 2006; Dansinger et al., 2005; Stern et al., 2004; Foster et al., 2004; Sondike et al, 2003).

At face value economic models appear to offer little in the way of explanatory power for this phenomenon. That is until you consider the findings of Astrup et al. (2004). Having undertaken an extensive review of the literature on this topic, they conclude that:

“A systematic review of low-carbohydrate diets found that the weight loss achieved is associated with the duration of the diet and restriction of energy intake, but not with restriction of carbohydrates.”

(Astrup et al., 2004: 897)

It was found that, despite not setting any constraints on calorie intake, the reason participants lost weight was because they were consuming less. Another study involving over 800 overweight adults randomly assigned participants to different diets based on varying protein, fat and carbohydrate ratios (Sacks et al., 2009). Each diet was designed in such a way that there was a deficit of 750<sub>Kcal</sub> compared with each participant’s Recommended Daily Allowance (RDA). The researchers found that participants lost an average of four kilograms of weight regardless of which diet they were on.

So why is it that people consume less on the Atkins’ diet even though there is no calorie constraint? The reasons for such behaviour become obvious once the decision-making process is viewed through the lens of economic theory.

### **Axioms of economic theory revisited**

While the assumptions of economic theory have come under a lot of criticism in recent times (Doerrenberg, 2009), special difficulties arise when attempting to apply an economic model to weight loss.

The first relates to the basic assumption that goods, in this case food, are indeed ‘goods’ and not ‘bads’. Apart from the obvious shortcoming, that too much food can make you sick, meaning that an additional unit would in fact be a ‘bad’, issues arise over consumers’ perception of food. If a person wants to lose weight, they might view food as a ‘bad’. Indeed, this is the basis of many eating disorders.

To overcome this, it will be assumed that despite the desire to lose weight, food is treated as a ‘good’, which seems plausible.

The second issue relates more generally to the assumption of rationality. This is particularly problematic as any consumer who embarks on the Atkins’ diet is making an irrational decision. The rational thing to do is to eat a healthy, balanced diet so as to maximise one’s overall well-being. If the rational thing to do is to lose weight, such as in the case of obesity, the most rational and sustainable way of doing so is to constrain overall calorie intake while continuing to eat a balanced diet. 25 percent of the body’s glucose supply is dedicated to neurological functioning (Kolb & Whisah, 2006) and by limiting the supply of carbohydrates, glucose cannot be produced. This could have negative implications for normal brain activity.

However, while health concerns have been raised, no consensus has yet to emerge on the welfare implications of the Atkins’ diet (Dansinger et al., 2005). This is largely due to the lack of investigations into its long-term effects. If the side effects are still relatively unknown, then this creates risk. As compensation for such risk, a weight loss premium should be required to incentivise people to start the Atkins’ diet. However, as outlined above, this is not the case. Therefore, it must be concluded that such individuals are risk seekers.

Despite these limitations, it will be assumed that consumers want to maximise their utility from the consumption of food. Furthermore, while it is the intuitive hunch of this author that further research will reveal significant health concerns associated with the Atkins’ diet; due to a lack of empirical evidence it will be assumed that the diet does not produce any adverse side effects.

### **An economic model of decision behaviour under the Atkins’ diet**

Having briefly reviewed the literature on this topic and establishing some additional axioms, a model of decision-making behaviour under the Atkins’ diet can be considered. Let us first restrict the model to the consumption of food, letting the consumption of carbohydrates (in grams) be denoted by  $X_2$ , and that of all other foods (that is, fats and proteins) be represented by  $X_1$  (also denoted in grams). The budget constraint will be given by:

$$P_1X_1 + P_2X_2 = RDA$$

$P_1$  will represent the ‘cost’ (in calories) of consuming an additional gram of carbohydrate. Likewise,  $P_2$  will denote the ‘cost’ (in calories) of consuming an additional gram of fat/protein. It is worth noting that each gram of carbohydrate represents  $4_{Kcal}$  of energy. Each gram of fat and protein ‘cost’  $9_{Kcal}$  and  $4_{Kcal}$  respectively. These are constant and therefore, individual budget constraints are

easily quantifiable given the each person's RDA and ratio of protein-to-fat consumption.

Utility will represent the pleasure, happiness or satisfaction derived from the consumption of food and will take on the usual economic characteristics, such as, diminishing marginal utility, increasing cumulative utility etc. Let us first consider a 'traditional' diet based solely on calorie constraint.

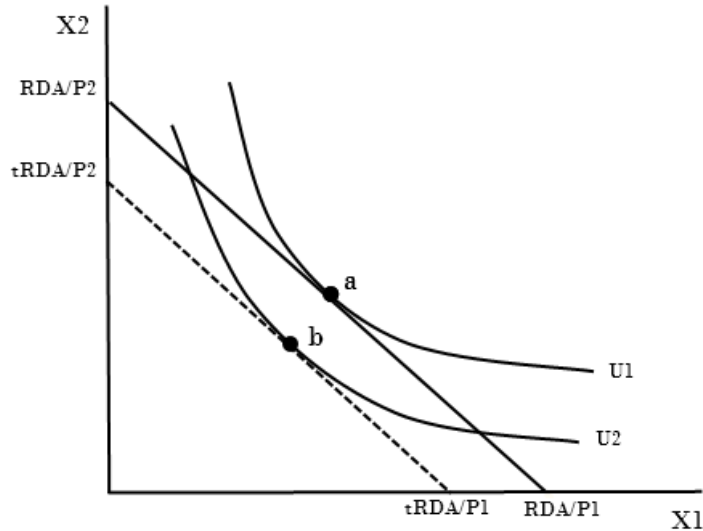


Figure 1: Optimal choice behaviour on a 'traditional' diet

Maximising utility subject to the above budget (or calorie) constraint will occur at point *a*, in Figure 1. resulting in consumption carbohydrate of  $X_1^a$  and fats/proteins of  $X_2^a$ . At point *a*, the marginal rate of substitution (MRS) between fats/proteins and carbohydrate will equal the slope of the budget constraint, that is:

$$MRS_{X_1X_2} = P_2/P_1$$

This will result in a Pareto efficient outcome. Now let us examine how the equilibrium changes once a calorie constraint is imposed. Imposing a constraint of  $t$ , where  $0 < t < 1$ , will yield the new budget constraint:

$$P_1X_1 + P_2X_2 = (t)RDA$$

Individual t ('traditional' diet) will now consume at point *b*, resulting in consumption of carbohydrates  $X_1^b$ , and fats/proteins  $X_2^b$ . Overall utility will fall as  $U_b$  is below  $U_a$ . This describes the behaviour of consumers on 'traditional' diets (assuming they adhere to the constraints imposed by the diet).

How will the behaviour of those on the Atkins' diet differ? As this diet only constrains the amount of carbohydrates a person consumes, the new budget constraint will be given by:

$$X_1 = CCa^*/P1$$

*\*Where CCa= endowment of calories from carbohydrate under the Atkins' diet*

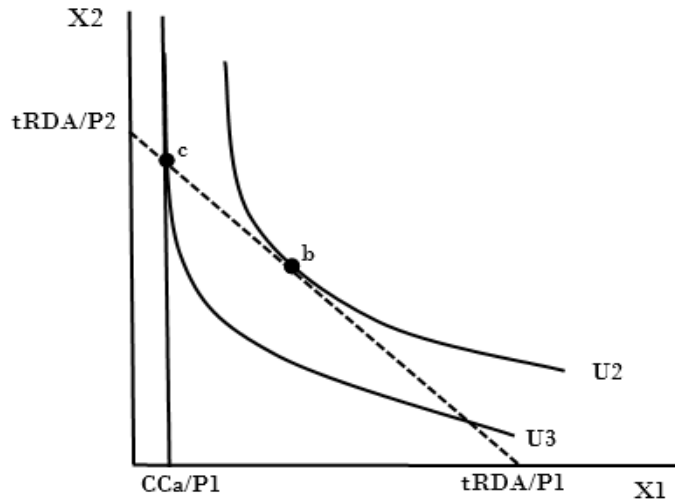


Figure 2: Optimal choice behaviour on the Atkins' diet

In this scenario, Individual *a* (Atkins' diet) will now consume at point *c*. This is the highest possible utility that can be gained from the given budget constraint. Overall utility will be lower on the Atkins' diet when compared with the 'traditional' diet. This occurs for two reasons. The first is obvious - people like choice. By depriving someone of choice they become worse off. The law of diminishing marginal utility provides the intuition behind this assertion. As a person consumes more of a good, the utility derived per additional unit of that good begins to decrease. Therefore, consuming more fats/proteins does not adequately compensate individuals for the utility foregone as a result of limiting carbohydrate intake.

However, why do those not on the Atkins' diet consume an infinite amount of fat and protein so as to increase utility? Any point above  $c$  is also tangent to the Atkins' diet budget constraint and so equally feasible. However, individuals do not consume above point  $c$  because, apart from the obvious health implications, those on the Atkins' diet must also consider an additional trade off. As there is no calorie constraint in place, such individuals must choose between consuming more  $X_2$  (fats/proteins) and weight loss (i.e. non-consumption), which will be denoted by  $X_3$ .

People derive happiness from weight loss and so individuals on the Atkins' diet must consider this trade off. With 'traditional' diets this decision is made for the consumer. Individuals on the Atkins' diet are already consuming the majority of their calories from  $X_2$ , therefore the utility derived from consuming an additional unit is already low. In addition, it is found that protein may serve as an appetite suppressant<sup>2</sup>. In essence, by encouraging dieters to consume more protein, the Atkins' diet helps to facilitate a reduction in overall calorie intake, despite not setting any limits on how much to consume. Indeed, research has demonstrated that an increase in protein consumption results in a sustained decrease in calorie intake and thus, in significant weight loss (Weigle et al., 2005). As such,  $MU_{X_3}$  will decline at an even faster rate.

Therefore, when faced with the trade off between  $X_2$  and  $X_3$ :

$$MU_{X_2} < MU_{X_3}$$

Note that the marginal utilities do not need to be weighted by price as the cost of both  $X_2$  and  $X_3$  are measured in terms of calories. Individuals on the Atkins' diet will reduce consumption of  $X_2$  until  $MU_{X_2} = MU_{X_3}$ . Therefore, consumers will not increase consumption of  $X_2$  beyond  $X_2^c$  as this would disrupt the equilibrium and decrease utility.

The plausibility of the assertion that those on the Atkins' diet consume the same amount of calories as those on 'traditional' diets, despite not imposing a calorie constraint, must be considered. It explains the empirical observation that there is no significant weight loss difference between individuals on the 'traditional' diets and those on the Atkins' diet. As Barbara Rolls, who holds the Guthrie Chair in Nutrition at Penn State University, argues:

"They're cutting calories, even if they don't realize it. No one has shown, in any studies that anything magical is going on with Atkins other than calorie restriction. The diet is very prescriptive, very restrictive, and limits half of the foods we normally eat. In the end it's not fat, it's not protein, it's not

---

<sup>2</sup> <http://news.bbc.co.uk/2/hi/health/3416637.stm>

carbs - it's calories. You can lose weight on anything that helps you to eat less, but that doesn't mean it's good for you."<sup>3</sup>

In other words, just because weight loss under the Atkins' diet is a counter-intuitive result, it does not mean that there are elaborate mechanisms at play such as those suggested by Dr Atkins. When viewed through the lens of economic theory, such a result becomes less obscure and simply the product of consumer maximising behaviour given a suboptimal constraint. As such, from an economic perspective, one would predict that weight loss from the Atkins' diet is equivalent to weight loss on 'traditional' diets.

## **Conclusion**

The above model attempts to explain the observation that individuals on the Atkins' diet lose the same amount of weight as those on 'traditional' diets. An ancillary aim of this article has been to dispel some of the myths that surround what is still a very controversial diet (Fumento, 2003). Despite its assertions, the reason individuals lose weight on the Atkins' diet is because they do exactly what those on 'traditional' diets do: they restrict calorie intake. However, there are some important implications for such an explanation of dieting behaviour.

While equal calories are consumed, it is done in an inefficient manner under the Atkins' diet. Weight loss may be equivalent, but utility diminishes by a greater amount. Therefore, by shifting from the Atkins' diet to more 'traditional' ones, it is possible to increase utility without consuming additional calories.

However, the shortcomings of this model must be considered. Firstly, it is a *post hoc* theory that reinterprets existing empirical findings. More research is required to validate the assertion of this model. Secondly, very little is known about the long-term effects of the Atkins' diet (Dansinger et al., 2005). It is possible that this model is only valid in the short run and other factors, such as health, influence the analysis in the long term. Longitudinal investigations are needed in order to shed light on some of the possible long-term implications of the Atkins' diet.

---

<sup>3</sup><http://www.webmd.com/diet/atkins-diet-what-it-is?page=3>

## Bibliography

- Astrup, A., Larsen, T., and Harper, A., 2004. Atkins and other low-carbohydrate diets: hoax or an effective tool for weight loss? *The Lancet*, 364(9437):897-899.
- BBB News, 2004. *Atkins diet boss: 'Eat less fat'* [Online]. London. Available at: <http://news.bbc.co.uk/2/hi/health/3408931.stm> [Accessed 8 March 2010].
- BBC News, 2004. *Uncovering the Atkins' diet secret* [Online] London. Available at: <http://news.bbc.co.uk/2/hi/health/3416637.stm> [Accessed 15 February 2010].
- Dansinger, M. L. Gleason J. A. Griffith J. L. Selker H. P. & Schaefer E. J., 2005. Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *The Journal of the American Medical Association*, 293(1):43-53.
- Doerrenberg, P., 2009. Will Homo economicus survive? *Student Economic Review*, 23(1):187-95.
- Foster, G. D., Wyatt, H. R., Hill J. O., McGuckin, B. G., Brill, C., Mohammed, B. S., Szapary, P. O., Rader, D. J., Edman, J. S. & Klein, S. (2003). A randomized trial of a low-carbohydrate diet for obesity. *The New England Journal of Medicine*, 348(21):2082-90.
- Fumento M., (2003). Big fat fake: the Atkins diet controversy and the sorry state of science journalism - Critical Essay. *Reason*. [Online] Available at: <http://www.fumnto.com/fat/reason.html> [Accessed 15 February, 2010].
- Sacks, F.; Bray G, Carey V, Williamson D, 2009. Comparison of weight-loss diets with different compositions of fat, protein, and carbohydrates. *New England Journal of Medicine*, 360(9):859-73
- Sondike, S. B., Copperman N. & Jacobson, M. S., 2004. Effects of a low-carbohydrate diet on weightloss and cardiovascular risk factors in overweight adolescents. *The Journal of Paediatrics*, 142(3):225-7.
- Stern, L., Iqbal, N., Seshadri, P., Chicano, K. L., Daily, D.A., McGrory, J., Williams M., Gracely, E. J. & Samaha F. F, 2004. The effects of low-carbohydrate versus conventional weight loss diets in severely obese adults: one-year follow-up of a randomized trial. *Annals of Internal Medicine*, 140(10):778-85.



WebMD, 2008. *The Atkins' Diet* [Online] New York. Available at: <http://www.webmd.com/diet/atkins-diet-what-it-is?page=3>[Accessed 12 February 2010].

Weigle, D.S., Breen P. A., Matthys, C. C., Callahan, H. S., Meeuws, K. E., Burden, V. R., Purnell, J. Q., (2005). A high-protein diet induces sustained reductions in appetite, ad libitum caloric intake, and body weight despite compensatory changes in diurnal plasma leptin and ghrelin concentrations. *American Journal of Clinical Nutrition*, 82(1):41-48.