

**UCDAVIS**  
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# **KETOGENIC DIET MARKET OVERVIEW AND OPPORTUNITIES**

**MARKET DISCOVERY PAPER  
JULY 2022**



## EXECUTIVE SUMMARY

Diets guide and facilitate efforts to consume fewer calories while maintaining normal daily functions. While there are a range of specific diets with different guidelines, they all have the goal of reducing calorie consumption.

Emerging diets such as keto and other low-carbohydrate diets extend this logic by trying to alter the metabolic processes in the human body. The human body is ordinarily geared to use glucose as an energy source. Glucose has a low barrier to metabolism and is the go-to fuel in “do-or-die” situations such as our ancient ancestors encountered - either you run away from the saber-toothed tiger, or you are eaten. But in modern life, such an approach is almost always unnecessary. And with practically limitless access to carbohydrates, excessive carbohydrate consumption can lead to a range of deleterious health effects, including diabetes<sup>1</sup> and cognitive decline.<sup>2</sup>

The ketogenic diet shifts this paradigm by compelling the body to enter a state of ketosis, in which ketones, or breakdown products from fats, are used as an energy source. The health effects of remaining in ketosis in the long-term are still being studied, but several trends have emerged. There appears to be evidence that diets leading to ketosis could potentially aid with weight loss, cognitive function, and anti-aging, among other potential benefits. In the following analysis, we discuss the current state of clinical evidence for the ketogenic diet’s benefits as well as the market dynamics in the space.

At a high level, the global addressable market for the keto diet is estimated at \$11-12 billion in 2022, growing at approximately 5%

CAGR. We see white space opportunities in keto products promoting benefits for anti-aging and cognitive health. Both are areas for which there is impressive clinical evidence of keto's benefits, and few brands are currently marketing products tailored to consumers who care about those issues.

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# DIET DEFINITIONS

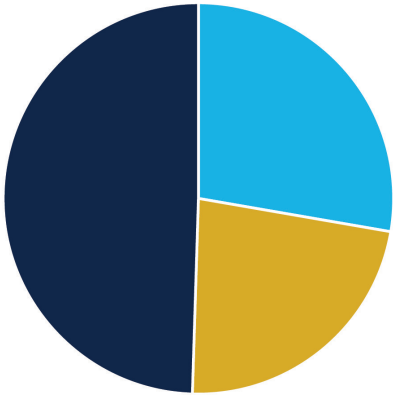
The ketogenic diet is a trending iteration of low-carb diets that have been in use for many years. “Low-carb diet” is an umbrella term that includes the ketogenic diet, in addition to: Low-Carb High-Fat (LCHF), Low-Carb Paleo Diet, Atkins Diet, Eco-Atkins, Zero-Carb, and Low-Carb Mediterranean Diet, among others.<sup>3</sup> Among these diets, Atkins and Paleo are similar to keto, but they focus more on protein intake, as opposed to the extreme fat calorie contribution in the keto diet.<sup>4</sup>

Macronutrient distributions are not one-size-fits-all – they depend on an individual’s goals and current health status. For example, those who are diabetic need to reduce sugar intake more than others. A useful reference point for a typical diet comes from the Institute of Medicine of the National Academies, which recommends the following Acceptable Macronutrient Distribution Ranges (AMDR).<sup>5</sup>

MACRONUTRIENT	% OF CALORIES (LOW)	% OF CALORIES (HIGH)
Carbs	45	65
Fats	20	35
Protein	10	35

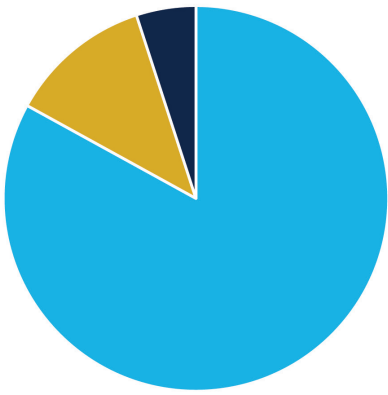
Low carb-diets have a significantly different macronutrient breakdown. The infographic below shows rough distributions, although they will vary by patient.

### TYPICAL DIET



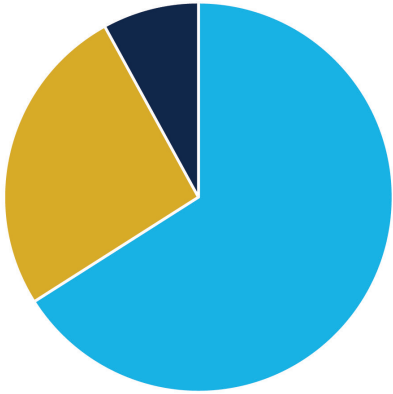
CARBS 50% FATS 28% PROTEIN 23%

### KETO



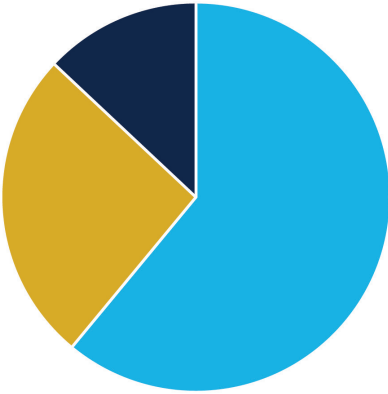
CARBS 5% FATS 83% PROTEIN 12%

### ATKINS 20



CARBS 8% FATS 66% PROTEIN 26%

### ATKINS 40



CARBS 13% FATS 61% PROTEIN 26%

The Atkins diet comes in two varieties, the Atkins 20 and Atkins 40 diets, which refer to the daily allowed grams of carbohydrates consumed.<sup>6</sup>

Atkins 20:

MACRONUTRIENT	% OF CALORIES (LOW)	% OF CALORIES (HIGH)
Carbs	5	10
Fats	60	70
Protein	20	30

Atkins 40:

MACRONUTRIENT	% OF CALORIES (LOW)	% OF CALORIES (HIGH)
Carbs	10	15
Fats	55	65
Protein	20	30

Low-carbohydrate diets force the body to power itself using ketone bodies, which are a type of fuel that the liver makes as a breakdown product from fats.<sup>4</sup> The ketogenic, or keto, diet, is distinguished by an arguably shocking fat content. For those on this diet, 75-90% of daily calories are derived from fat.<sup>6</sup> Keto is also even more restrictive on carbs than either of the Atkins diets, topping carbs at 5% of daily intake.

Keto:

MACRONUTRIENT	% OF CALORIES (LOW)	% OF CALORIES (HIGH)
Carbs	0	5
Fats	75	90
Protein	5	20

At a basic level, the requirements include keeping carbohydrate intake from 20-50 grams per day, which over a few days drives the body into ketosis. For context, if one followed the Dietary Guidelines for Americans from the USDA and Department of HHS, on a 2,000-calorie diet, that would equate to 225 to 325 grams of carbohydrates per day.<sup>7</sup> So clearly, the keto diet necessitates a drastic shift in most Americans' diets. In addition to limiting carbohydrates, excessive protein intake can also interfere with ketosis, although it is important to consume enough protein to support muscle growth.<sup>8</sup>

## POTENTIAL BENEFITS OF THE KETO DIET

While most consumers initially are drawn to the ketogenic diet for its perceived weight loss benefits, research has shown it also has benefits in other areas, including diabetes management, anti-aging, cognitive health, and energy level. In the section below, we discuss the state of research that supports these perceived benefits to assess which claims may create the strongest evidence-based product offerings.



## WEIGHT LOSS

As with most diets, a major driver of adoption of the keto diet is the promise of weight loss. According to survey data from US World & News report, the top goal for keto subscribers was weight loss at 84%, while 66% adopted the diet because they wanted to improve overall health.<sup>10</sup> In order for weight loss to occur on a ketogenic diet, those on the diet must be able to successfully transition their metabolism to ketosis.<sup>11</sup> Typically, clients on the diet see some results immediately because of water loss – as glycogen is depleted, the water it retains is released.<sup>12</sup> However, this lost water weight will be regained if a person resumes their previous level of carbohydrate consumption.<sup>12</sup> A potentially more long-lasting mechanism for keto weight loss is the increased satiety effect of proteins and potential reduction in the hunger hormone, ghrelin.<sup>8</sup> Alternatively, keto could be inducing reduced lipogenesis and an increase in fat oxidation.<sup>8</sup> Two other proposed mechanisms with less support are that keto followers may have a greater metabolic efficiency in fat oxidation or that the energy requirement of switching your body's metabolism to rely heavily on gluconeogenesis creates a thermic effect, essentially wasting energy.<sup>8</sup>

While results vary, a compilation of clinical studies showed that patients can lose up to 24% of their body weight on the keto diet.<sup>13</sup> The numerical weight loss of course depends on the clients' starting weight and the length of the study. To give a few reference points, a 90-day study on Type II diabetic patients showed average weight loss of ~20 pounds, and a 6-month study on severely obese patients showed a weight loss of ~13 pounds.<sup>13</sup> For comparison, a 2014 survey of 7,286 Americans found a range of 13 - 14.4 average pounds lost in one year following the Weight Watchers, Zone, Volumetrics, Atkins, Rosemary Conley, Jenny Craig, and Ornish diets (listed in order of increasing weight loss).<sup>14</sup> Beyond

the survey data, in one meta-analysis of 13 controlled trials, the overall study population exhibited 0.91 kg greater weight loss on a “very-low-carbohydrate ketogenic diet” compared to an “energy-restricted low fat diet”.<sup>15</sup> One note of caution is most studies conducted using keto diets for weight loss were short-term, 12 weeks or less, and some did not utilize control groups.<sup>16</sup> Clearly, more research is needed to determine the long-term efficacy of the keto diet for sustained weight loss.

In an associated field to weight loss, some researchers have investigated whether the keto diet can help with cardiovascular health, which is often correlated with weight. However, the results are mixed. A 2017 review of published papers connecting the keto diet to reduction in cardiovascular risk factors concluded that the literature had not yet established long-lasting links between the keto diet and cardiovascular health.<sup>17</sup> The connection to cardiovascular health is an area to watch, given the prevalence of cardiovascular disease in developed nations.

## DIABETES

Low carb diets such as keto have gained particular attention among those suffering diabetes, due to the important role that carbohydrates play in diabetes. The body breaks down carbohydrates into glucose.<sup>18</sup> Then, insulin excreted by the pancreas facilitates the absorption of glucose into cells to fuel bodily function. Shortages of insulin can cause excessive blood sugar levels, known as hyperglycemia. While diabetics supplement insulin, an alternative or complementary approach is to limit the amount of carbohydrates consumed in the first place, for which a low-carb diet can help. While in theory, the ketogenic diet could help to manage both Type I and Type II diabetes, so far the evidence is stronger for management of Type II diabetes, which is more closely linked to diet and lifestyle, versus Type I which is genetically linked.<sup>19</sup> A meta-analysis of studies on the connection between the keto diet and Type II diabetes showed a range of impressive outcomes, including withdrawal of insulin, significant decreases in plasma glucose and hemoglobin A1C levels, and up to 75% improvement in insulin sensitivity.<sup>20</sup>

## AGING AND MUSCLE STRENGTH

Several UC Davis studies have looked into the effects of low-carb and keto diets on the delay of muscle aging and lifespan. While focused on mice, some of the findings have potential implications for humans as well. In the study by Roberts et al, mice on the keto diet (89% fat) were observed to live 13.6% longer than those on the control diet (65% carbs).<sup>21</sup> Those on a low-carb diet (70% fat) fell in-between these groups and did not demonstrate a statistically significant difference from either. Mice on the keto diet also showed superior performance in strength-related tests and demonstrated slower declines in cognitive and motor function as they aged. While the biological mechanism of these advantages is still under investigation, the writers hypothesize “ketones positively impact muscle homeostasis.” Since this study was based on mice, it is likely that more human data will need to be collected before these data could be meaningfully translated into marketing campaigns.

A subsequent UC Davis study from 2020 looked specifically at declines in skeletal muscle known as sarcopenia, and whether a ketogenic diet could ameliorate this disease.<sup>22</sup> If true, this could present an additional attractive market opportunity for keto and low-carb brands, since 14% of those ages 65-69 and 50% of those older than 80% have sarcopenia. Previous studies demonstrated that calorie restriction delays muscle loss, with the shift to ketosis as one potential mechanism.<sup>23,24</sup> While this would suggest the promise of a keto diet for sarcopenia, a caveat is that keto restricts protein consumption, which is needed to prevent sarcopenia. Indeed, this study did show better muscle maintenance in the keto diet group compared to the control. Together with the 2017 Roberts paper, these papers suggest an opportunity to advertise new brands targeted at an increasingly elderly population in developed countries.

## ATHLETIC PERFORMANCE

The keto diet has been attractive to those who are already healthy but are looking to maximize their physical performance. This trend has been driven by several high-visibility influencers who have praised its benefits, most notably LeBron James (who followed a modified version for a few months).<sup>25</sup> Based on the observed enhancement of musculoskeletal strength on the keto diet, keto could have an attractive market opportunity in athletics. One advantage that the keto diet has over other “crash diets” is that it does not deprive the body of energy, but rather just provides a different source.<sup>8</sup> One caveat is that the keto diet prevents muscle hypertrophy because it inhibits the insulin-like growth factor 1 (IGF-1)/AKT/mTOR pathway.<sup>8</sup> Ironically, many bodybuilders do follow the keto diet when they are “bulking” despite the metabolic evidence pointing to the ineffectiveness of this approach. The scientific evidence endorses the keto diet more strongly for endurance sports, for which there are clear benefits of weight loss without energy deprivation.

## COGNITIVE HEALTH AND MENTAL ENERGY

As mentioned above, weight loss is the most common perceived benefit drawing consumers to the keto diet. However, many consumers also report cognitive benefits. Dr. Ryan Lowery, CEO of Ketogenic.com, claims, “a lot of people come into keto for short term weight loss, but then see other benefits around improved cognitive function or clearer less foggy thinking.”<sup>26</sup>

A 2020 study from Stony Brook University recently found several links between low-carb diets and cognitive health. According to the study, “Even in younger adults, under age 50, dietary ketosis (whether achieved after one week of dietary change or 30 minutes after drinking ketones) increased overall brain activity and stabilized functional networks.”<sup>27</sup> Therefore, even long before people show evidence of cognitive decline, the keto diet could have appeal for those trying to compete in an impacted global economy. However, another study showed mixed results: participants on a low-carb diet showed memory impairment but performed better on tasks requiring vigilant attention.<sup>28</sup>

Using the keto diet for cognitive health is consistent with its earliest origins, in which it was used as a treatment for epilepsy, first introduced by Dr. Wilder at the Mayo Clinic in 1921.<sup>29</sup> More recently, clinical evidence has bolstered the claim that the keto diet can be effective at managing symptoms of epilepsy. Between 1992 and 2012, seven clinical trials demonstrated significant rates of seizure reduction in children following the ketogenic diet.<sup>29</sup> Despite its success, the mechanism for ketosis in managing epilepsy is unknown, but some hypotheses include: ketones may directly inhibit epilepsy, polyunsaturated fatty acids

(PUFAs) may limit the excitability of neuronal membranes, or the keto diet may limit inflammation and excitotoxicity-mediated neuronal cell death.<sup>29</sup> It is worth noting that the evidence for seizure amelioration from the keto diet is weaker for adults.<sup>29</sup>

These studies demonstrate that the keto diet's perceived benefits are grounded in science. However, several risks inherent to a keto diet, outlined below, must also be considered.

## RISKS OF THE KETO DIET

While there are clear benefits to the keto diet, those benefits must be weighed against potential adverse health outcomes. In addition, the benefits will only be realized if the diet is adhered to, which is challenging in relation to other diets.



## HEALTH RISKS

While keto and other low-carbohydrate diets certainly can have benefits, they are not without risks. Some potential complications include: high saturated fat content, deficiency of some nutrients such as calcium, Vitamin D, carnitine, and selenium, liver and kidney issues, GI issues such as constipation due to low fiber intake, and some anecdotal reports of mental confusion.<sup>4</sup> Many people following these specialized diets receive the aid of a health coach, or they at least listen to many of the prominent keto influencers, some of whom have huge followings on their podcasts and social media. One danger to those following the diet is that every person can respond differently to a diet, and those who don't fully understand how to follow it correctly could damage their health. For example, Dr. Lawrence J. Cheskin of George Mason University recommends the keto diet for significantly overweight patients but focuses on educating them that they cannot simply get their fat from greasy foods like hamburgers, which he describes as a “heart attack diet.”<sup>30</sup> Instead, Cheskin urges keto dieters to get their fat from mono-unsaturated and polyunsaturated fats, fibrous grains, and vegetables.<sup>30</sup>

In addition, some are concerned about the keto diet because the state of ketosis is somewhat like ketoacidosis, which is suffered by those with Type 1 Diabetes.<sup>16</sup> In this state, ketone bodies lead to dangerously high blood acid levels. The key difference between ketosis and ketoacidosis is the level of ketonemia, which stays at 7-8 mmol/l in ketosis but can rise to 20 mmol/l in ketoacidosis.<sup>20</sup> Also, blood pH is unaffected in ketosis, but is lowered by the increased acidity from ketoacidosis.<sup>20</sup> Insulin deficiency can lead to ketoacidosis because normally, insulin prevents excessive ketone production. However, it is unlikely (although

a few cases have been observed clinically<sup>31,32</sup>) for ketoacidosis to occur in otherwise healthy people on the keto diet.<sup>16</sup> Most keto dieters produce enough insulin to inhibit the ketone levels from rising too high.<sup>16</sup> Still, given the fact that ketogenic diets are attractive to diabetic individuals, this risk should not be ignored.

## DIET ADHERENCE

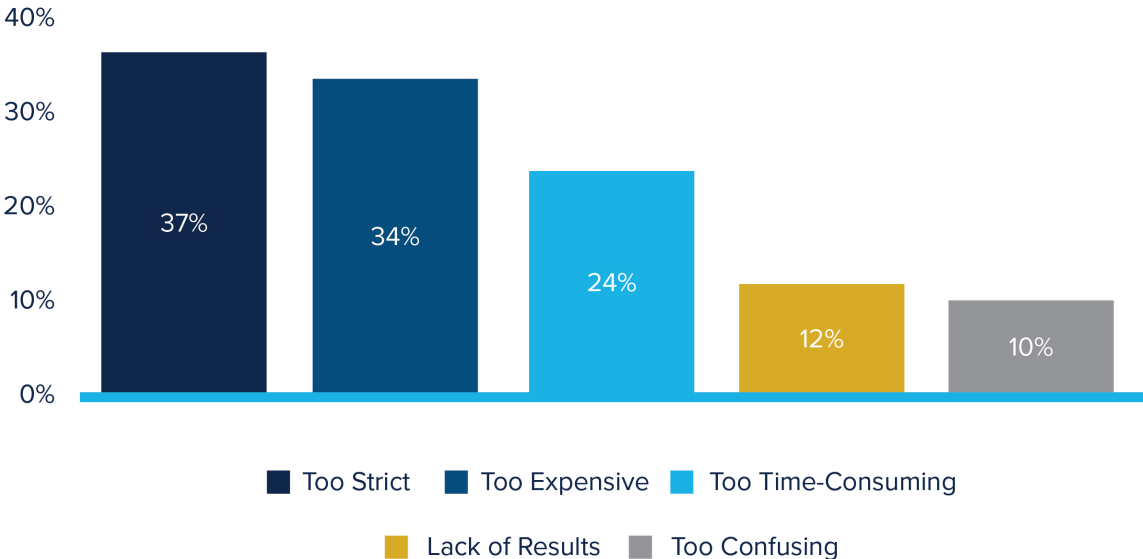
In addition to the above-mentioned health risks from following keto and low-carb diets, there is also the less dramatic risk they might just not be effective if not adhered to properly.

A 2015 study found similar rates of adherence to both low-fat and low-carbohydrate diets.<sup>11</sup> However, the 2015 Hu study acknowledged that there are a greater number of low-fat options currently available on the market, which in theory could aid adherence to a low-fat diet, relative to following a keto or other low-carb diet. Larger analysis would be needed to establish if it is true that adherence is the same to low-carb and low-fat diets in the general population, since as discussed above, there are health and psychological barriers to adhering to a keto diet.

In addition, there is certainly a transition period that consumers must be able to tolerate to get used to being in ketosis, and there is often a time when people lack energy. This transition period is so common it is informally called the “keto flu” among keto dieters, describing the discomfort people feel during the first week.<sup>33</sup> Other reasons for discomfort during keto can include: cravings for carbohydrates, calorie deficiency, fat deficiency, irregular eating schedule, and insufficient exercise.<sup>33</sup> It can take time for people on this diet to optimize all of the above factors in order to attain the benefits of the keto diet, and during this period, many people will relapse to their original diet. Therefore, analysis of the benefits of the keto and other low-carbohydrate diets must be viewed through the lens of a relatively high rate of diet abandonment.

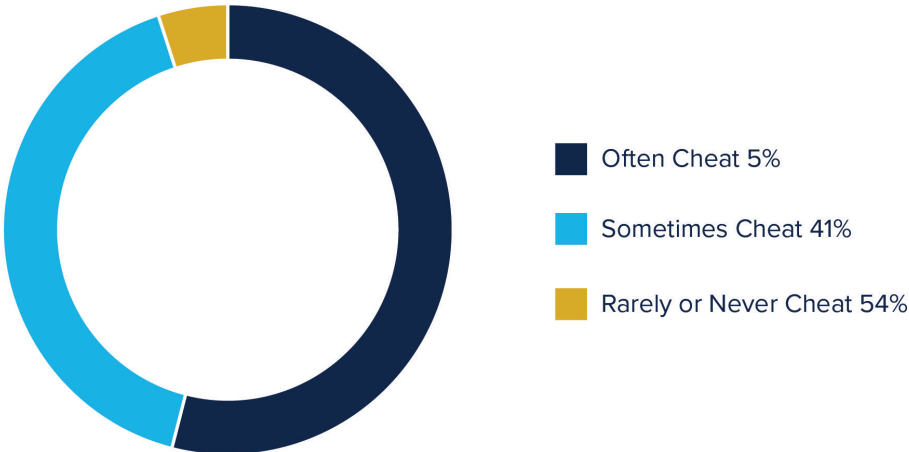
A Canadian survey from Dalhousie University determined the most common reasons for abandoning the diet:<sup>34</sup>

## REASONS FOR ABANDONING KETO DIET



In addition, those who want to stay on the keto diet effectively would need to track their blood ketone levels, but according to a U.S. News survey, 70% of “adherents” to the diet do not monitor this.<sup>10</sup> In addition, a large portion admit at least sometimes “cheating” on the diet.<sup>10</sup>

## “CHEATING” ON DIET



The above limitations to adherence must be taken into consideration when comparing the efficacy of keto to other more moderate diets that may show less dramatic weight loss results, but on average may have better outcomes if they are more consistently followed.

## CURRENT MARKET OVERVIEW

While it is still growing, there are some signs that the keto market may be reaching maturity, so the market might be a difficult area for new entrants.

## MARKET SIZING

The ketogenic diet market is part of the larger “Weight Loss and Control Market” estimated at \$78 billion in 2019.<sup>35</sup> While this market declined by 21% in 2020 due to the pandemic and its associated economic downturn, it seems likely that it will rebound as people return to more active lifestyles. Therefore, the overall TAM (Total Available Market) can be estimated to be this \$78 billion figure. SAM (Serviceable Available Market) will be evaluated as the portion of this TAM corresponding to the ketogenic diet. SOM (Serviceable Obtainable Market) would correspond to the market share that a particular company could achieve.

Despite its relative recency, the keto market is already a multibillion industry. We compiled SAM estimates from several different market research organizations, which seem to converge at a total market size between \$11-12 billion, with a growth rate above 5%.<sup>36-39</sup> At this growth rate, there is likely to be continued entry into the category.

Source	Beginning	Beginning Market Size	End	Ending Market Size	CAGR	2022 Interpolation
Grand View Research	2019	\$9.6 Billion	2027	\$14.7 Billion	5.50%	\$11.2 Billion
The Insight Partners	2019	\$10.2 Billion	2027	\$15.3 Billion	5.30%	\$11.9 Billion
Bolst Global	2020	\$10.9 Billion	2027	\$15.6 Billion	5.30%	\$12.1 Billion
Quince Market Insights	2021	\$11.5 Billion	2030	\$20.4 Billion	6.56%	\$12.3 Billion

While the market is still growing, some indicators of future growth are less encouraging. As shown in the graph below, Google searches for “keto” peaked in January 2019, with peaks around New Years’ each year since, but to a decreasing magnitude.

## GOOGLE INTEREST OVER TIME

JANUARY 01, 2015 - JUNE 01, 2022



This decline in search could be indicative of either declining interest or a maturation in public awareness. If it a sign of declining interest, that could be a reason why potential new entrants might want to consider other opportunities, since it is easier to gain share in a growing market than one that is plateauing.



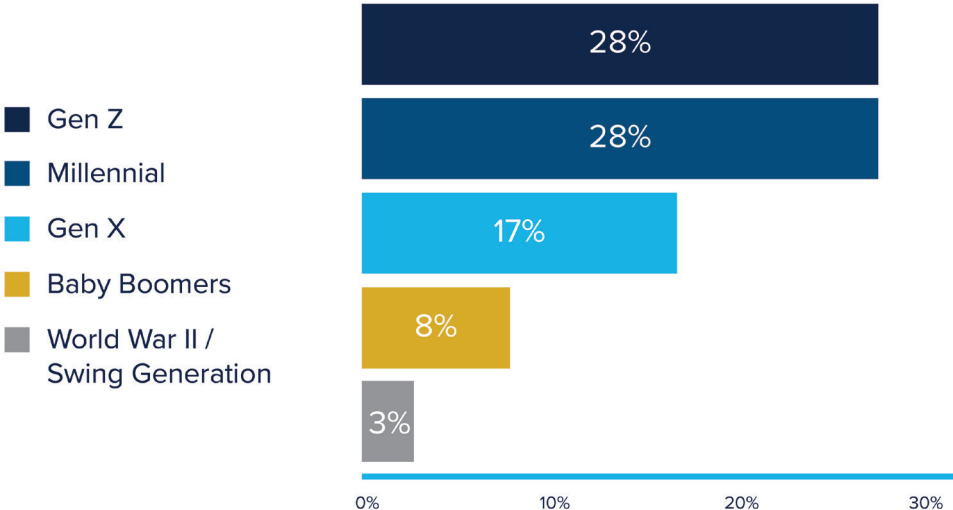
# MARKET SEGMENTATION

There does not appear to be one particular target customer for keto. It has attracted proponents across gender and age, who turn to this diet for different reasons.

Several studies focused on women elucidate the possibility for market opportunities related to weight loss specifically for female consumers. One area of potential benefit exclusive to women is in fertility hormones, especially among overweight women who are struggling to become pregnant. A 2017 study concluded, “reducing carbohydrate load can reduce circulating insulin levels, improve hormonal imbalance, and resume ovulation to improve pregnancy rates compared to usual diet.”<sup>40</sup> This study primarily used subjects who had a PCOS comorbidity, so its conclusions mentioned that further research on the effects of low-carb diets on non-PCOS related infertility would be warranted.

The keto diet is also of particular interest to younger consumers: an Agropur presentation cites Mintel data showing the interest in keto by generation:<sup>41</sup>

## INTEREST IN TRYING KETO DIET, BY GENERATION



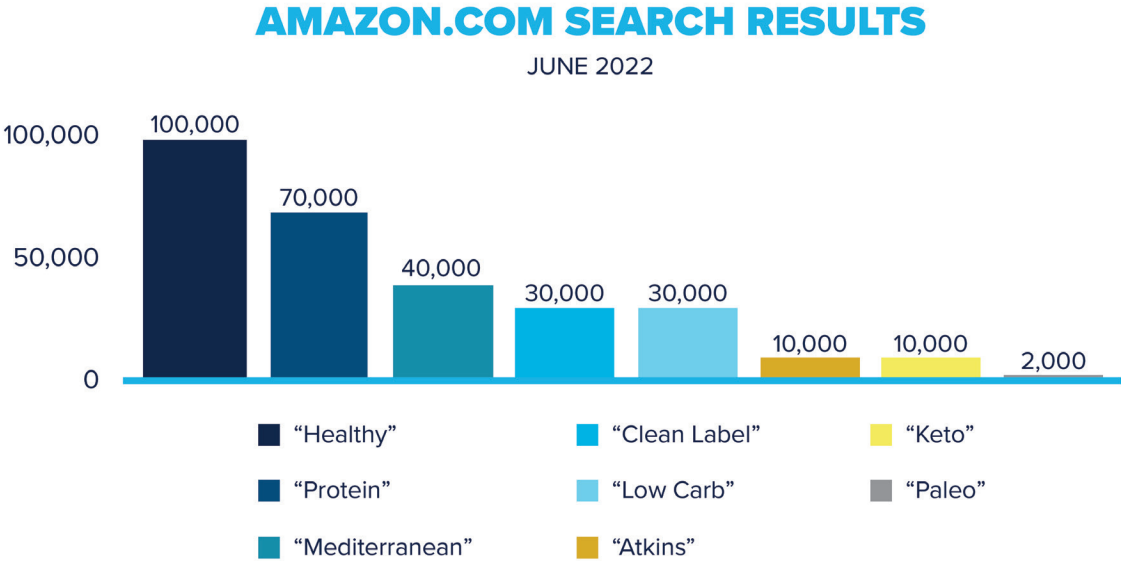
The fact that younger consumers are preferentially interested in this market also corresponds well with keto brands' success in the e-commerce distribution channel. For example, the keto meal kit brand Perfect Keto, which started as direct-to-consumer, ecommerce only, was able to grow from zero to a \$100M brand in only two years.<sup>42</sup>

In addition to younger consumers, a major market segment for these offerings is those with diabetes, obesity, and other metabolic diseases. The need for such interventions is particularly glaring given the increasing rates of obesity in the U.S. and globally. As of 2019, 32.6% of men and women in the U.S. were classified as obese.<sup>43</sup>

Lastly, diet communities and lifestyle brands are significant voices within the weight loss and control market. Jenny Craig and WW (previously Weight Watchers) are good examples of lifestyle-driven, community-based brands. Both brands support low-carb rather than purely keto diets. Their communities represent potential converts to the keto diet, and unsurprisingly both of their websites include critiques of the keto diet in relation to their own plans. Jenny Craig argues that “Keto is the quick fix of the moment to help people lose weight, but it could be difficult to maintain a healthy lifestyle long term”.<sup>44</sup> Unsurprisingly, Jenny Craig argues that their weekly designed menus are a more sustainable path, which are low-carb but not so restrictive that they can't be maintained long-term. WW stresses their supportive community as an asset that helps users stay on their plans.<sup>45</sup> Of course, Keto proponents would likely argue that there are robust communities to support their users as well, though it remains to be seen if the keto communities will be as long-lasting as large incumbents like Jenny Craig and Weight Watchers.

# TYPES OF PRODUCTS

Since 2015, there has been an explosion of products making claims related to keto diets.<sup>46</sup> Categories of such products include: baking mixes and ingredients, bone broth, meats, oils, high fat foods, low-carb foods, snacks, coffee products, other beverages, protein bars, and supplements. The term “keto” returns over 40,000 products on Amazon.com.<sup>47</sup>



The share growth of products that either make a keto claim or reasonably could make one between 2015 and 2020 was:<sup>47</sup>

- 2822% for bars
- 697% for chocolate
- 564% for baking mixes
- 83% for condiments
- 10% for other snacks

The below exhibit is an illustrative showcase of the multitude of keto claims and scope of products currently available on the market. Products and their images were sourced from Walmart.com.<sup>48</sup>

## SNACKS



EPIC Keto Friendly  
Pork Rinds & Meat Bites

QUEST Low Carb, High  
Protein, Keto Friendly Bars,  
Cookies and Chips



Kiss My Keto Gummy Bears &  
SlimFast Fat Bomb Snack Cup

BAKING & INGREDIENTS



Duncan Hines Keto Brownie Mix and Frosting

Lonolife Paleo and Keto Friendly Chicken Bone Broth Powder

Health Garden Certified Keto Monk Fruit Sweetener



Kiss My Keto MCT Oil

COFFEE PRODUCTS



Rapid Fire Keto Coffee and Creamer

SUPPLEMENTS



Orgain Keto Collagen Protein Powder w/ MCT Oil

Slimfast Keto Meal Replacement Shake Powder

KetoScience Dual Action Fat Burn Capsule



Within the “Grocery and Gourmet Food” category, on Amazon.com’s “Best Sellers” list, 47 out of the 700 products (6.7%) contain keto claims. (This excludes the subcategories: Flowers, Baby Food, Homebrewing & Winemaking.)

As of June 2022, the top performers in each subcategory are:

**#30 Overall and #1 in Pantry Staples:  
Lakanto Baking Monk Fruit Sweetener**



**#21 in Alcoholic Beverages: Craftmix Cocktail Mixers Blood Orange Mai Tai Flavor**

**#3 in Breads and Bakery: HighKey Sugar Free Cookies Variety Pack**

**#14 in Breakfast: Atkins Indulge Treat Caramel Nut Chew Bar**

**#8 in Dairy, Eggs & Plant-Based Alternatives: 4th & Heart Original Grass-Fed Ghee**

**#2 in Deli and Prepared Foods:  
Rip Van WAFELS Dutch Caramel & Vanilla Stroopwafels**



**#12 in fresh meal ingredient kits: Sunturi keto Zero carb keto noodles with Pad Thai keto sauce**

**#5 in Meat & Seafood: Old Wisconsin Honey Brown Sugar Turkey Sausage Snack Sticks**

**#9 in Meat Substitutes: Anthony’s Organic Vital Wheat Gluten**

**#1 in Produce: BetterBody Foods  
Organic Chia Seeds with Omega-3**

#1 in Snacks and Sweets: Quest  
Nutrition Birthday Cake Protein Bars

**Insights:** Several interesting themes  
appear across the keto category.

Namely: the use of alternative sweeteners, an emphasis on fat and MCT oil, cognitive health claims, keto supplements, and the co-mingling of other trends (free-from claims and clean label).



The use of alternative sweeteners such as monk fruit, stevia, erythritol, and allulose allows keto followers to avoid sugar while still finding a way to sweeten. Additionally, these alternative sweeteners often induce a lower glycemic response in the body which may be beneficial for certain individuals. The downside of these sweeteners is that some consumers report gastrointestinal distress when consumed in excess, and that some sugar alcohols still contribute a marginal number of calories which would be contributed to the user's total carbohydrate count. Nevertheless, suppliers of these products such as "Health Garden" and "Lakanto" have gained significant market share.

Once again, a jarring aspect of keto is the emphasis on fat in the diet. We see this prominently in SlimFast's "Fat bomb" product. The choice to embrace the fat aspect of the diet may come at a cost though as 35% of US consumers think low fat is an important claim, 40% of Chinese consumers pay attention to the fat content of foods, and 62% of UK consumers worry about the total fat content in food and drink products.<sup>41</sup>

MCT Oil is also a very popular ingredient among those following the keto diet. Medium-chain triglycerides (MCT's) are metabolized directly in the liver, boosting ketone production.<sup>49</sup> Because of their metabolic pathway,



MCT's are less likely to be stored as body fat, supporting the weight-loss goals of many of a ketogenic diet. Also, MCT's are reported by users to increase satiety, which can help with overall calorie reduction. Some manufacturers, such as Buddha bars, propose that MCT's also ameliorate some of the energy deficiency issues associated with the keto diet.<sup>50</sup>

Where the most cognitive health claims are being made appear to be within the bone broth and supplement product lines. For example, the brand "Osso Good" promotes the following benefits to consumers: Immune Support, Stress Recovery, Weight Loss, Protein, Collagen, and Enhanced Cognitive Function.<sup>51</sup>

Supplement companies have also begun to provide ketone salts and esters as products. These companies, such as HVMN, Pruvit, and deltaG, provide drinkable versions of Acetoacetate (AcAc) and Beta-hydroxybutyric acid (BHB), both metabolites of ketosis. Their concept is that instead of forcing the user's body into ketosis through diet control, customers may consume these alternative forms of energy directly. However, it is still unclear what effect elevated ketone levels have on a person who is not following a keto diet regime already (IE restricting their carbohydrate intake and elevating their fat percentage).

Regarding other claims, we see examples of many of the "free-from" claims focused on GMO ingredients, artificial sweeteners, gluten, dairy, and soy. The combination of keto with the clean label trend seems to be mixed. Some brands such as Epic have focused on limited ingredients and have embraced the hunter-gatherer connotations of Paleo and other low-carb diets.<sup>52</sup> Other brands such as Quest appear to be betting on keto and disregarding the clean label trend with extensive ingredient lists suggesting that Quest believes that the target consumers within these movements are different.

# SUPPLEMENTAL MARKET: DEVICES AND APPS

The growth of the keto market has also led to a proliferation of auxiliary products such as devices for testing ketone levels and apps to help people on the keto diet track their progress.

**DEVICES** When searching for “ketosis device” on Amazon, the top results included both blood monitors and breathalyzers, as pictured below.<sup>53</sup> Based on the thousands of reviews for the blood monitor and hundreds for the breathalyzer, it seems these are well-known items that can be expected to continue selling well as the keto diet becomes more widely adopted. However, they are durable goods that presumably will be one-time purchases, so the addressable revenue is likely smaller than for keto-friendly consumer packaged goods.



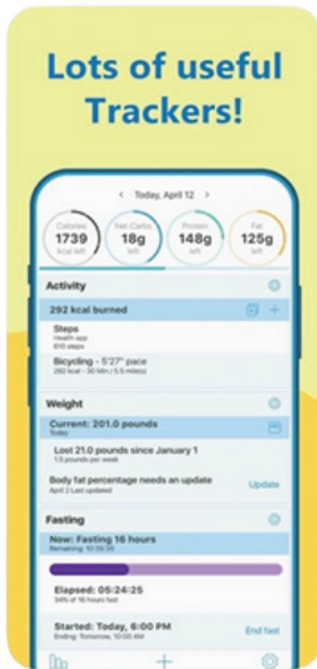
KetoBM Blood Ketone Meter

Lencool Ketone Breath Meter



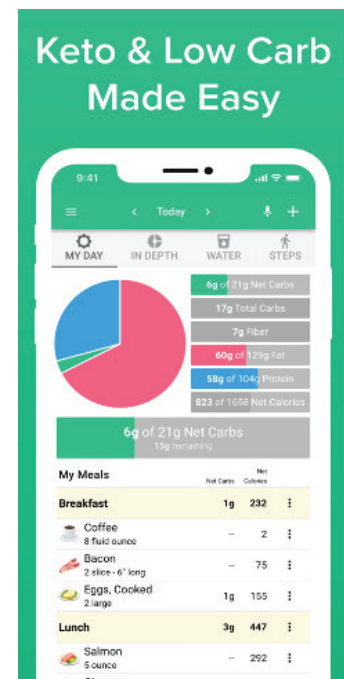
## APPS

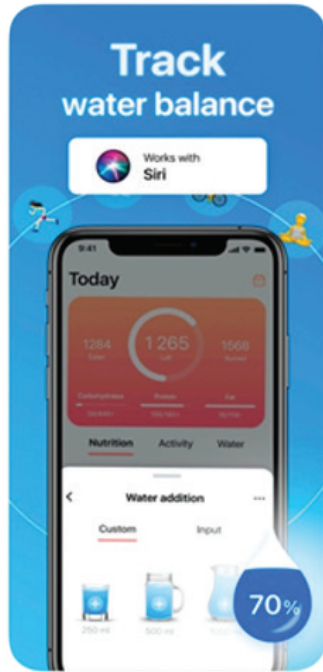
Along with the ability to measure their blood ketone levels with these devices, many consumers track their progress using apps that allow them to connect to keto-focused communities. When searching for “keto” on the iPhone app store, the three top-appearing (non-promoted) apps are:<sup>54</sup>



Keto Diet app by Keto.app: this app promotes having over 15 million users, this app allows users to count their carbs, track personal macros, search foods in a database for their macronutrient breakdowns, follow keto-friendly recipes, and track progress such as weight loss.

Carb Manager – Keto Diet Tracker: also boasting more than 15 million users, this app has many of the same features as the Keto Diet app, but features over 350,000 recipes, as well as different programs that users can follow, including both keto and Intermittent Fasting. It also features a community where users can build profiles and share their progress with other users.





Keto diet app. Macro tracker: – in addition to having many of the features of the other two apps, this app allows users to track their water balance, which is useful since much of the initial weight loss on the keto app is driven by losing water that is retaining glycogen.

## INVESTMENT ACTIVITY AND NEW PRODUCT LAUNCHES

Investment reported on Pitchbook for companies focusing on keto-friendly products appears to be limited (Pitchbook). At the same time, there



continues to be a healthy rate of new product launches in the keto space in the last year, both from new startups like JIMMYBAR!, and from incumbents like SlimFast.<sup>48,56,57</sup> This dichotomy suggests that these companies still see room for growth in the market, while the investment community is somewhat more cautious. Among investors who did bet on keto, the five largest deals since 2019 included the following companies.

Disruptive Enterprises received a \$7.75 million investment from One Better Ventures in 2019. Disruptive Enterprises offers a range of keto-friendly supplements, including its tongue-in-cheek “FBOMB” nut butter pouches.<sup>58</sup>



HVMN raised \$5.62 million, led by Liquid 2 Ventures in 2020. HVMN offers the Ketone-IQ liquid supplement discussed above, and promotes the energy-promoting effects of its products.<sup>59</sup>



KetoCrisp from CanDo raised \$2.75 million from angel investors in 2021. KetoCrisp features a range of keto bars for which they promote the features “low carb,” “healthy fats,” “low sugar,” and “gluten free.”<sup>60</sup>

BioCoach raised \$4 million from SecretLab in 2022. BioCoach offers a blood level tracking device that keto followers can use to monitor their ketone levels.<sup>61</sup>

The most notable recent acquisition in this space was the \$1 billion purchase of Quest Nutrition, which offers many keto-friendly bars and snacks, by Simply Good Foods. Simply Good Foods owns the Atkins brand, so this deal represents some consolidation in the low-carbohydrate diet space.<sup>62</sup>



## COMPLEMENTARY MARKET: INTERMITTENT FASTING

Physiologically, fasting also leads to a state of ketosis. Thus, products and apps dedicated to intermittent fasting may also serve many of the same consumers who are being drawn to keto. Intermittent fasting comes in different levels of severity, but in general consists of restricting any calorie intake to certain times of day. This could be an 8–12-hour window, or in more extreme cases could just consist of one meal per day. In addition to its obvious weight-loss benefits, intermittent fasting also leads to ketosis, and in fact some describe the keto diet as mimicking the effects of fasting without the accompanying energy deprivation.<sup>8</sup> The intermittent market is harder to size than keto or low-carb more generally, since it does not correspond to a particular set of products, but rather the absence of consumption during certain parts of the day.

## CONCLUSION

Today, the ketogenic diet and ketosis are most strongly related in the consumer's mind with weight management – all other benefits are ancillary. Therefore, most products in the market today target weight loss as a benefit and do so by focusing on macronutrient combinations which support the ketogenic diet. Many products marketed for the ketogenic diet underperform from a consumer experience dimension compared to their more mainstream analogues.

Based on our review of the scientific literature associated with the ketogenic diet, there is robust emerging evidence that it can facilitate not only weight loss but also control of Type II diabetes, longevity, muscle development, and increased cognitive performance. In addition, there are a range of potential health care applications which continue to be researched. There is considerable opportunity to continue to develop products and services which support the specific ketogenic diet using novel flavor and texture technologies to create a better sensory experience. Also, the utilization of technologies such as ketone esters to deliver these benefits without the need for strict diet adherence is relatively unexplored.

However, consumer education on the benefits of ketosis beyond weight management remains a significant obstacle and would require considerable marketing and education efforts. A major question to be resolved is whether to initially lean into the consumer understanding of ketones in terms of weight management and develop from there, or whether a wholesale “reframing” could help consumers to better understand the available benefits.



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