**<https://www.ers.usda.gov/amber-waves/2014/june/trends-in-u-s-per-capita-consumption-of-dairy-products-1970-2012/>**

**Trends in U.S. Per Capita Consumption of Dairy Products, 1970-2012**

* U.S. availability of ice cream has declined since its peak of 22.7 pounds in 1946. Despite the multitude of offerings in the ice cream aisle, ice cream availability has fallen to 12.9 pounds per person in 2012, down from 16.7 pounds in 1970
* Over the last four decades, Americans have increased their consumption of cheese, especially Italian varieties such as mozzarella, parmesan, and provolone. The inclusion of cheese in time-saving convenience foods and in commercially manufactured and prepared foods such as frozen pizza, macaroni and cheese, and pre-packaged cheese slices has increased consumption. The popularity of cheese-rich Italian and Tex-Mex cuisines has also contributed to increased cheese consumption.
* Competition from other beverages—especially carbonated soft drinks, fruit juices, and bottled water—is likely contributing to the changes in frequency of fluid milk consumption. In addition, substitutes for cow’s milk (including nut milks, coconut milk, and soy milk) have provided alternatives for consumers.

[**https://www.ers.usda.gov/webdocs/publications/102447/err-300\_summary.pdf?v=6474.6**](https://www.ers.usda.gov/webdocs/publications/102447/err-300_summary.pdf?v=6474.6)

**Examining the Decline in U.S. Per Capita Consumption of Fluid Cow’s Milk, 2003–18**

* Many factors contribute to declining fluid cow’s milk consumption, including demographic and generational changes in the U.S. population. Younger generations who grew up drinking less milk as children appear to consume less at all ages. However, even after accounting for demographic and generational changes, there is still a downward trend in consumption over the survey period. This decrease appears to reflect changes in the competitiveness of cow’s milk compared to other beverages at retail stores, as well as the competitiveness of cereal compared to other breakfast options.

[**https://www.ers.usda.gov/amber-waves/2022/june/fluid-milk-consumption-continues-downward-trend-proving-difficult-to-reverse/**](https://www.ers.usda.gov/amber-waves/2022/june/fluid-milk-consumption-continues-downward-trend-proving-difficult-to-reverse/)

**Fluid Milk Consumption Continues Downward Trend, Proving Difficult to Reverse**

* Underlying the long-run downward trend in milk drinking are differences in the eating and drinking habits of newer and older generations. [A 2013 ERS report](https://www.ers.usda.gov/publications/pub-details/?pubid=45075) shows that newer generations are consuming less fluid milk than preceding generations. Individuals born in the 1970s, for example, drank less milk in their teens, 20s, and 30s than individuals born in the 1960s did at the same age points. Those born in the 1980s and 1990s, in turn, appear likely to consume even less fluid milk in their adulthood than those born in the 1970s. These differences across generations reflect in part their unique eating choices as children. Every decade brings a wider selection of beverage choices at supermarkets, restaurants, and other food outlets.Nutritionists have pointed out that consumption of sugar-sweetened beverages such as soft drinks and juice drinks increased during the 1980s and 1990s and appeared to be replacing milk. However, in recent years, U.S. per capita consumption of sugar-sweetened beverages also has declined. Using data on households’ beverage choices between 2013 and 2018, [ERS researchers examined](https://onlinelibrary.wiley.com/doi/epdf/10.1002/agr.21706) households’ purchases at retail grocery stores of milk, soft drinks, 100-percent juice and juice drinks, bottled water, and coffee and tea drinks. They found little evidence that consumption of one beverage was offset by consumption of another. That is, competition between milk and these other major beverage categories was found to have little effect on milk purchases over those years.There was, however, evidence that plant-based milk alternatives, such as almond milk and soy milk, do compete with fluid cow’s milk. [ERS research](https://www.ers.usda.gov/amber-waves/2020/december/plant-based-products-replacing-cow-s-milk-but-the-impact-is-small/) using household scanner data confirms that sales of these beverages are negatively affecting purchases of fluid cow’s milk. Still, the increase in their sales is much smaller than the decrease in sales of fluid cow’s milk, so plant-based milk alternatives can explain only a small share of overall sales trends. Sales of plant-based milk alternatives may be contributing to sales trends for fluid cow’s milk but are not likely to be a primary driver of those trends.

[**https://www.ers.usda.gov/webdocs/publications/45073/37650\_err149\_summary.pdf?v=3286.7**](https://www.ers.usda.gov/webdocs/publications/45073/37650_err149_summary.pdf?v=3286.7)

**Why Are Americans Consuming Less Fluid Milk? A Look at Generational Differences in Intake Frequency**

* Differences across the generations in fluid milk intake may help account for the observed decreases in per capita fluid milk consumption in recent decades despite public and private sector efforts to stem the decline. Furthermore, these differences will likely make it difficult to reverse current consumption trends. In fact, as newer generations replace older ones, the population’s average level of fluid milk consumption may continue to decline.

**Cheese consumption is growing among Americans**

* ***Strong demand for natural cheese*** Per capita consumption of American-style natural cheeses such as cheddar, colby and jack cheeses rose from 11.7 pounds in 1995 to more than 15 pounds in 2017. Meanwhile, per capita consumption of natural Italian-style cheeses (dominated by mozzarella) rose from 10 pounds to more than 15 pounds during the same timeframe

**Model**

Following this idea, we proceeded to implement a Nonparametric Bayesian clustering on the functional data describing the consumption of dairy in the last forty years. In the model below the yit represents the consumption of dairy I at time t, z and x are design matrices, alpha and beta are covariates of the linear model and take into account respectively the level of the time series and its trend. The theta are described as an autoregressive process of order 1 to take into consideration the effect of time. The clustering is performed only on the gamma = , in order to consider only the trend and the persistence of the time-series. To perform such clustering a DP is set as prior for the distribution of the parameters gamma.

**Cluster analysis**

The first thing we can notice is how the consumption of fluid milk is decreased in the last forty years. Many factors contribute to declining fluid cow’s milk consumption, including demographic and generational changes in the U.S. population. Younger generations who grew up drinking less milk as children appear to consume less at all ages.

Another cause can be found in the competition from other beverages—especially carbonated soft drinks, fruit juices, and bottled water—which is likely contributing to the changes in the frequency of fluid milk consumption. In addition, substitutes for cow’s milk (including nut milk, coconut milk, and soy milk) have provided alternatives for consumers.

Moreover, it’s worth mentioning the decline in consumption of ice cream contrasted with the increase in fluid yoghurt. These differences across generations reflect in part their unique eating choices as children. Every decade brings a wider selection of dessert choices at supermarkets, restaurants, and other food outlets.

To conclude we can notice how, over the last four decades, Americans have increased their consumption of Italian varieties of cheese such as mozzarella, parmesan, and provolone. The inclusion of cheese in time-saving convenience foods and in commercially manufactured foods such as frozen pizza and pre-packaged cheese slices, such as cheddar, has made increased the consumption of these varieties of dairy.

**Conclusion**

For what concerns the choice of which product to produce, it’s reasonable to invest, in the short term, in the varieties which have seen an increase in their consumption over the last few years. The best types of dairy in which to invest now are the Italian varieties of cheese and the ones used in commercially manufactured foods.

***Presentation***

To conclude, we performed a nonparametric Bayesian clustering on the time series describing the dairy consumption in the US in the last 40 years. To do so we applied the described model, which clusters our data setting a Dirichlet process as prior for the distribution of the parameters beta and theta which represent the trend of the series and their persistence described as an autoregressive process. We obtained 3 clusters, and we can instantly notice that the first cluster contains the dairy with an increasing trend over the years, the second the ones with decreasing consumption and the third the cheese and kinds of milk with an oscillating behaviour.

To be able to suggest to a stakeholder which dairy is more convenient to invest in, it is  
necessary to understand which dairy had an increase in consumption in the last years and  
most importantly why.

The first thing we can notice is how the consumption of fluid milk is decreased in the last forty years, mainly due to the generational changes in the U.S. population but also because of the competition from other beverages, especially juices and milk substitutes.

Moreover, Americans have increased their consumption of Italian varieties, as mozzarella, and time-saving convenience foods, such as cheddar.

Finally, based on the choice of strategy wanted by the stakeholder is possible to suggest investing in increasing-consumption dairy for a conservative approach or in the element of the third cluster, which highlights a slight increase in the last years, for a more aggressive strategy.

Possible improvements to our work could be the embedding of import and export data and finding a way to relate dairy sales from the spatial analysis to the optimal quantity of milk to produce.

Thanks for your attention.