

# **Dutchess County Trans Fat Survey Report**

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## **Introduction**

Trans fats are manufactured by adding hydrogen atoms to unsaturated vegetable oils. This process of partial hydrogenation results in production of a semisolid fat (Mozaffarian 2006) with higher melting points and increased shelf life of the fats and the foods they are added to (D'Arrigo 2007; Stender et al. 2007). Trans fats are commonly found in margarines, spreads, pre-fried foods, bakery products, and vegetable oils used for frying, baking and cooking (Mozaffarian 2006; Stender et al. 2007). These trans fats, or partially hydrogenated vegetable oils (PHVOs), have been found to raise low-density lipoprotein (LDL) cholesterol and lower high-density lipoprotein (HDL) cholesterol, which has been linked to a number of health conditions including increased risk of heart disease and diabetes (D'Arrigo 2007). Higher intake of trans fats is also indicated in increased weight gain (Mozaffarian 2006; Stender et al. 2007).

Naturally occurring trans fats are found in meat and dairy products, but at much lower percentages than artificially produced trans fats (Stender et al 2007). Naturally occurring trans fats are not generally implicated to have the same negative health affects/risks as industrially produced fats (D'Arrigo 2007).

Despite the increased shelf life and storage capabilities, from a nutritional standpoint trans fats have no known health benefits (Mozaffarian 2006). Adverse health effects are seen at even low levels of intake (approximately 2 to 7g for 2000 calories per day) and thus, in order to minimize health risks associated with trans fat intake, it is recommended that trans fat intake be limited or avoided altogether (Mozaffarian 2006). Additionally, there are a number of healthy alternatives to trans fat use. Un-hydrogenated or fully hydrogenated vegetable oils can be used to prepare foods that commonly contain PHVOs (Mozaffarian 2006).

Due to the health risks associated with trans fat consumption, a number of regulations have been put into place regarding sale of products containing trans fat. In 2003, Denmark passed legislation that regulated sale of foods containing trans fats. Fats and oils in these food items were replaced mostly with unsaturated fatty acids that have proved to be fairly equal in cost, quality and availability to the trans fats they replace (Mozaffarian 2006). Regulations have also been put in place in the United States. On January 1, 2006, the Food and Drug Administration (FDA) required that that all nutritional labels indicate the level of trans fat content (Mozaffarian 2006). However, manufacturers can label food items as containing "0 trans fat" if the product contains less than 0.5g per serving. In this case, the ingredient list must mention partially hydrogenated vegetable oil as an ingredient (Mozaffarian 2006; D'Arrigo 2007). While foods that are packaged now require proper labeling to indicate trans fat content, restaurants are another potential source of trans fat consumption and are not obligated to report ingredient lists to consumers.

During the months of May and June 2005, the New York City Department of Health and Mental Hygiene conducted a survey in 529 food service establishments (FSEs) to assess the presence of PHVOs in oils used for frying, baking and spreads, as

well as foods prepared off-premises (Goldstein 2006). Results from this study found that 33% of sampled food service establishments used at least one product that contains PHVOs. This was soon followed by an educational campaign to encourage FSEs and food suppliers to voluntarily reduce/remove products containing PHVOs. A follow up survey conducted in April 2006 determined that trans fat use in FSEs did not decline after the educational campaign.

On July 1, 2007, New York City implemented a ban on NYC FSEs from serving or storing partially hydrogenated vegetable oils, shortenings or margarines used for frying, grilling or spreads, unless the food contains less than 0.5g of trans fat per serving. By July 1, 2008 this ban will extend to include oils and shortenings used for deep frying cake batter and yeast dough (Okie 2007).

## **Methodology**

A survey was conducted to assess the extent of use of trans fat, partially hydrogenated vegetable oils (PHVOs), in food service establishments in Dutchess County, NY. This pilot study, and survey design, was modeled after New York City Department of Health and Mental Hygiene's study in 2005. Surveys were conducted in 100 restaurants between the months of March and April 2007. Each establishment was surveyed once by a sanitarian from the Dutchess County Health Department.

Restaurants were chosen for this survey if they had a well-established client base and were locally owned. Additionally, restaurant owners that maintain multiple food service establishments within Dutchess County were also targeted under the assumption that future educational campaigns/outreach would be able to target a larger number of establishments. Large fast food chains were not included under the basis that any future work (i.e. change in menu) would not be up to the individual, local establishments, but rather up to corporate headquarters.

Each establishment was asked to identify the fats used for three different cooking methods; fats used for frying (Frying Fats), for baking or cooking (Baking Fats) and for spreading (Spread Fats). Information on PHVO content for fats used in each cooking method was collected. The public health sanitarians inspected ingredient lists for the listing of partially hydrogenated vegetable oils, regardless of the packaging label.

The establishments were also asked to identify five specific pre-processed products prepared off premises (french fries, mozzarella sticks, chicken nuggets, fish sticks and hamburger buns) that are cooked and served in the establishment. Information on presence/absence of PHVOs in each of these products was also collected by a visual inspection of the ingredient list on the product label.

Data collected were entered into Microsoft Access 2000 SR-1 Professional and analyzed in STATA Intercooled 8.0. Due to low expected frequencies, Fisher's exact test of the independence hypothesis was performed in the place of a chi square test.

For analysis purposes, PHVO content was specified in the following way; for each cooking method, if more than one fat was used, and at least one contained PHVOs, the restaurant was counted as using fats containing PHVOs. A restaurant was counted as not using PHVOs if none of the fats used contained PHVOs. When PHVO content was undeterminable, it was considered as missing and removed for the analyses purposes. Additionally, some restaurants did not use all of the specified cooking methods and in these instances, the fields remained blank.

## Observations

### *Summary Statistics on types of restaurants surveyed:*

Surveys were completed for 100 restaurants in 19 towns in Dutchess County. These 19 towns contain 91.2% of the targeted food service establishments in the county. The majority of restaurants surveyed (27%) are located in Poughkeepsie, which coincides with a denser population and higher number of food services establishments (31.8%) within the county (Table 1).

<b>Zip Code Boundaries</b>	<b>Surveyed Restaurants</b>	<b>Total Targeted Restaurants</b>
Amenia (12501)	4 (4%)	13 (1.6%)
Beacon (12508)	5 (5%)	46 (5.8%)
Dover Plains (12522)	2 (2%)	11 (1.4%)
Fishkill (12524)	8 (8%)	70 (8.8%)
Hopewell Junction (12533)	7 (7%)	52 (6.5%)
Hyde Park (12538)	8 (8%)	34 (4.3%)
LaGrangeville (12540)	2 (2%)	19 (2.4%)
Millerton (12546)	4 (4%)	14 (1.8%)
Pawling (12564)	5 (5%)	24 (3.0%)
Pine Plains (12567)	2 (2%)	14 (1.8%)
Pleasant Valley (12569)	3 (3%)	24 (3.0%)
Poughkeepsie (12603 and 12601)	27 (27%)	253 (31.8%)
Poughquag (12570)	1 (1%)	10 (1.3%)
Red Hook (12571)	3 (3%)	34 (4.3%)
Rhinebeck (12572)	6 (6%)	40 (5.0%)
Salt Point (12578)	2 (2%)	5 (0.6%)
Staatsburg (12580)	1 (1%)	5 (0.6%)
Wappingers Falls (12590)	8 (8%)	67 (8.4%)
Wassaic (12592)	2 (2%)	5 (0.6%)

Table 1. Percent of surveyed restaurants and total targeted restaurants at each location.

Restaurants were labeled as one of six categories: bakery (specializes in baked goods), catering (specializes in food preparation for parties and special events), deli (wider and fresher menu than fast food restaurants, usually food is made to order), diner

(varied and extensive menus, typically serves breakfast, lunch and dinner), fine dining (high-end restaurant with more expensive menu items), standard full service dining (typical restaurant, serves lunch and dinner, menu is less varied than diner). Table 2 shows the number of surveyed restaurants for each service type.

<b>Restaurant Type</b>	<b>Number of restaurants</b>
Bakery	1 (1%)
Catering	2 (2%)
Deli	2 (2%)
Diner	19 (19%)
Fine Dining	16 (16%)
Standard Full Service Dining	60 (60%)

Table 2. Number of restaurants for each restaurant category.

Of the surveyed establishments, 79% provide takeout, 34% provide outdoor seating and 24% provide both.

***Summary Statistics on cooking methods and presence of PHVOs:***

Fats used for the three types of cooking methods were investigated; frying, baking and spreads. Restaurants varied in the number of different fats used for each cooking methods (Table 3). The majority of restaurants (over 60%) use one or two different fats for each cooking method. **However, over 35% of restaurants use more than one type of fat for each of the three cooking methods.**

Number of Fats Used	Cooking Methods		
	Frying Fats	Baking Fats	Spreads Fats
1	64 (64.6%)	30 (34.5%)	42 (51.9%)
2	25 (25.3%)	31 (35.6%)	31 (38.3%)
3	6 (6.1%)	19 (21.8%)	4 (4.9%)
4	4 (4.0%)	6 (6.9%)	4 (4.9%)
5	0 (0%)	1 (1.1%)	0 (0%)
<b>Total</b>	<b>99</b>	<b>87</b>	<b>81</b>

Table 3. Number of fats used for each cooking method

The following three tables show the numbers of fats, and PHVO content, for each cooking method (Table 4a-c).

Number of Frying Fats Used	Frying Fats			Total
	Contains PHVOs	Does not contain PHVOs	Can't determine	
<b>Uses 1 Frying Fat</b>	5	54	5	<b>64</b>

<b>Uses 2 Frying Fats</b>	8	17	0	<b>25</b>
<b>Uses 3 Frying Fats</b>	4	2	0	<b>6</b>
<b>Uses 4 Frying Fats</b>	2	2	0	<b>4</b>
<b>Uses 5 Frying Fats</b>	0	0	0	<b>0</b>
<b>Total</b>	<b>19</b>	<b>75</b>	<b>5</b>	<b>99</b>

Table 4a. Number of frying fat and PHVO content

Number of Baking Fats Used	Baking Fats			Total
	Contains PHVOs	Does not contain PHVOs	Can't determine	
<b>Uses 1 Baking Fat</b>	3	25	2	<b>30</b>
<b>Uses 2 Baking Fats</b>	12	18	1	<b>31</b>
<b>Uses 3 Baking Fats</b>	12	6	1	<b>19</b>
<b>Uses 4 Baking Fats</b>	5	1	0	<b>6</b>
<b>Uses 5 Baking Fats</b>	1	0	0	<b>1</b>
<b>Total</b>	<b>33</b>	<b>50</b>	<b>4</b>	<b>87</b>

Table 4b. Number of baking fat and PHVO content

Number of Spread Fats Used	Spread Fats			Total
	Contains PHVOs	Does not contain PHVOs	Can't determine	
<b>Uses 1 Spread Fat</b>	9	33	0	<b>42</b>
<b>Uses 2 Spread Fats</b>	10	21	0	<b>31</b>
<b>Uses 3 Spread Fats</b>	2	1	1	<b>4</b>
<b>Uses 4 Spread Fats</b>	2	1	1	<b>4</b>
<b>Uses 5 Spread Fats</b>	0	0	0	<b>0</b>
<b>Total</b>	<b>23</b>	<b>56</b>	<b>2</b>	<b>81</b>

Table 4c. Number of spread fat and PHVO content

Not all restaurants surveyed use all three cooking methods (frying, baking, and spreads). Out of the 100 restaurants surveyed, only 64 use all three cooking methods. Out of these 64 restaurants, 24 (37.5%) did not use any fats that contain PHVOs, while only four (6.25%) used fats for all three containing PHVOs. Of the remaining 36 restaurants that use all three cooking methods, at least one fat used contained PHVOs in one form or another.

Table 5 shows the breakdown of presence of PHVO in the three cooking methods by geographic location of the food service establishment. In total, 52 restaurants surveyed use some form of PHVOs. PHVO use was undetermined at five restaurants. There does not seem to be a geographic determinant in the presence of PHVOs use.

Zip Code Boundaries	Yes, uses PHVOs	No, doesn't use PHVOs	Can't Determine
Amenia (12501)	3 (75.0%)	1 (25.0%)	0 (0.0%)
Beacon (12508)	2 (40.0%)	3 (60.0%)	0 (0.0%)

Dover Plains (12522)	1 (50.0%)	1 (50.0%)	0 (0.0%)
Fishkill (12524)	3 (37.5%)	5 (62.5%)	0 (0.0%)
Hopewell Junction (12533)	3 (42.9%)	4 (57.1%)	0 (0.0%)
Hyde Park (12538)	5 (62.5%)	3 (37.5%)	0 (0.0%)
LaGrangeville (12540)	2 (100.0%)	0 (0.00%)	0 (0.0%)
Millerton (12546)	3 (75.0%)	0 (0.00%)	1 (25.0%)
Pawling (12564)	3 (60.0%)	2 (40.0%)	0 (0.0%)
Pine Plains (12567)	1 (50.0%)	1 (50.0%)	0 (0.0%)
Pleasant Valley (12569)	2 (66.7%)	1 (33.3%)	0 (0.0%)
Poughkeepsie (12603 and 12601)	12 (44.4%)	13 (48.2%)	2 (7.4%)
Poughquag (12570)	1 (100.0%)	0 (0.0%)	0 (0.0%)
Red Hook (12571)	2 (66.7%)	1 (33.3%)	0 (0.0%)
Rhinebeck (12572)	1 (16.7%)	3 (50.0%)	2 (33.3%)
Salt Point (12578)	2 (100.0%)	0 (0.0%)	0 (0.0%)
Staatsburg (12580)	1 (100.0%)	0 (0.0%)	0 (0.0%)
Wappingers Falls (12590)	1 (50.0%)	4 (50.0%)	0 (0.0%)
Wassaic (12592)	1 (50.0%)	1 (50.0%)	0 (0.0%)
	<b>52 (52.0%)</b>	<b>43 (43.0%)</b>	<b>5 (5.0%)</b>

Table 5. Number of restaurants within each town and use of PHVOs.

Table 6 shows the breakdown of presence of PHVO in the three cooking methods by restaurant type.

<b>Restaurant Type</b>	<b>Yes, uses PHVOs</b>	<b>No, doesn't use PHVOs</b>	<b>Can't determine</b>
Bakery	1 (100%)	0 (0%)	0 (0%)
Catering	2 (100%)	0 (0%)	0 (0%)
Deli	0 (0%)	2 (100%)	0 (0%)
Diner	9 (47.4%)	9 (47.4%)	1 (5.2%)
Fine Dining	10 (62.5%)	5 (31.3%)	1 (6.2%)
Standard Full Service Dining	30 (50.0%)	27 (45.0%)	3 (5.0%)

Table 6. Number of restaurants of each type and use of PHVOs.

Restaurant use of five specific pre-processed food items (french fries, mozzarella sticks, fish sticks, chicken nuggets and hamburger buns) were also counted. Table 7. displays the number of restaurants that serve each of these specific foods.

<b>Specific Food</b>	<b>Number of Restaurants</b>
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French Fries	73 (73%)
Mozzarella Sticks	49 (49%)
Chicken Nuggets	38 (38%)
Fish Sticks	20 (20%)
Hamburger Buns	53 (53%)

Table 7. Number of restaurants that serve each type of specific, pre-processed food item.

### **Analysis**

A summary of fats for each cooking method was calculated based on the presence of PHVOs. The following assumptions were made: for each cooking method, if more than one fat was used, and at least one contained PHVOs, the restaurant was counted as containing PHVOs. A restaurant was counted as not using PHVOs only if none of the fats used contained PHVOs. If PHVO content could not be determined for any one fat (i.e. due to missing labels) and at least one fat was determined to contain PHVOs for that cooking method, than that fat was also counted as containing PHVOs. However, if PHVO content was undetermined for a fat and all other fats for that cooking method did not contain PHVOs, than PHVO content could not be determined and these fats were removed from the analysis and considered missing data. In the case of restaurants that did not use all of the specified cooking methods, the fields remained blank for that method.

Table 8 shows the percentage of restaurants that used PHVO containing fats for each cooking methods. When each cooking method was considered alone, a higher percentage of restaurants used fats that did not contain PHVOs. However, when all of these cooking methods were considered together, the percentage of restaurants that used at least one type of fat containing PHVOs is slightly higher (54.7%) than the percentage of restaurants that use fats with no PHVOs (45.3%).

	<b>Contains PHVOs (%)</b>	<b>Does not contain PHVOs (%)</b>
Frying Fat	19 (20.2%)	75 (79.8%)
Baking Fat	33 (39.8%)	50 (60.2%)
Spreads Fat	23 (29.1%)	56 (70.9%)
<b>All Fats</b>	<b>52 (54.7%)</b>	<b>43 (45.3%)</b>

Table 8. Percentage of fats that contain PHVOs.

Fisher's exact test was performed to determine if the presence of PHVOs in each type of cooking method correlated with restaurants that have either takeout or outdoor seating. There was no significant relationship for any type of cooking method (Table 9).

<b>Types of cooking methods</b>	<b>Takeout (p-values)</b>	<b>Outdoor Seating (p-values)</b>
Frying Fats	1.00	0.056
Baking Fats	0.430	0.341
Spreads Fats	0.156	0.451

Table 9. Results from Fisher's exact test to determine a correlation for fats between each type of cooking method and restaurants that had either takeout or outdoor seating.

Table 10 shows the percentage of restaurants that serve the specific pre-processed foods with or without PHVOs (as indicated on the label).

Specific Food	Contains PHVOs	Does not contain PHVOs
French Fries	34 (80.9%)	8 (19.1%)
Mozzarella Sticks	22 (57.9%)	16 (42.1%)
Chicken Nuggets	8 (44.4%)	10 (55.6%)
Fish Sticks	8 (50.0%)	8 (50.0%)
Hamburger Buns	4 (18.2%)	18 (81.8%)

Table 10. PHVO content in specific, pre-processed food items.

These food items are fried on the premise before being served (except hamburger buns). Foods served that do not contain PHVOs may be cooked in frying fats that contain PHVOs. Therefore correlating the presence of PHVOs in frying fats with the specific food will help reveal the overall presence of PHVOs in these items (Table 11).

	Both food and fat contain PHVOs (%)	Both food and fat do not contain PHVOs (%)	Food contains PHVOs, fat does not contain PHVOs (%)	Fat contains PHVOs, food does not contain PHVOs (%)
French Fries	26.0	13.0	56.0	5.0
Mozzarella Sticks	20.0	37.0	40.0	3.0
Chicken Nuggets	18.0	41.0	29.0	12.0
Fish Sticks	13.0	40.0	33.0	13.0

Table 11. Cross tabulation results for PHVOs content in specific foods and cooking method (frying fats)

## Discussion

Within the restaurants surveyed in Dutchess County, 54.7% use at least one type of fat (frying, baking, spreads) that contain PHVOs. There does not appear to be a correlation between use of PHVO containing fats and presence of takeout, outdoor seating or geographic location of the food service establishment.

Of the specific pre-processed foods, the majority of french fries and mozzarella sticks contain PHVOs, while most chicken nuggets and hamburger buns served do not contain PHVOs. Additionally, the use of frying fats with PHVOs as a cooking medium for these specific foods (with the exception of hamburger buns) increases the possible consumption of PHVOs for each product. As seen in Table 11, 26% of French fry and 20% of mozzarella sticks served contain PHVOs and are also fried in fat containing

PHVOs. Only 13% of French fries served at these establishments contain no PHVOs nor are cooked in frying fat containing PHVOs.

When calculating the number of fats used in conjunction with the presence/absence of PHVOs, in this survey, an important concern should be addressed. Over 35% of restaurants use more than one type of fat for each cooking method. Presence of PHVO containing fats for each cooking method was counted if only one of these fats contain PHVOs. Therefore, the presence of PHVOs may not be accurately represented for all fats used at restaurants where multiple fats are used. Thus, a consumer at a restaurant that uses more than one type of fat, but where not all contain PHVOs, may be exposed to less PHVOs than from a restaurant that serves only one type of fat that does contain PHVOs.

While research has shown that even low levels of intake can have adverse health effects (Mozaffarian 2006), it is important to note that this study did not assess the level of PHVO content in each of the fats used. Differing levels of PHVO content in these fats can result in differing PHVO intake levels.

Additionally, this was a pilot study and many numbers for these analyses represent a small sample size and consequently may not be a proper representation of trans fat use within food service establishments in Dutchess County.

## **Conclusion**

This pilot survey assessed the use of PHVOs within 100 sampled food services establishments in Dutchess County. This study was modeled after a 2005 study conducted by New York City Department of Health and Mental Hygiene.

Over 50% of Dutchess county restaurants surveyed were using at least one type of fat or oil containing PHVOs. This is much higher than New York City's findings of 33%. Of the prepared foods identified, french fries were the most likely to be served and the most likely to not only contain PHVOs, but also to be fried in oil containing PHVOs.

Using the information collected in this survey, further studies and/or surveys can be employed to better understand trans fat use within in Dutchess County. Modifications to the existing survey, such as identifying the types of fats used (ex. Brands), the amount that each is used and the level of PHVO content could help to better illustrate likely exposure a consumer would face when visiting these establishments.

Educational campaigns could help increase the knowledge that restaurant owners/managers have regarding trans fat use and health risks associated with consuming trans fats. Increasing the awareness of trans fat health risks and increasing the understanding and knowledge of healthy alternatives to trans fat use within restaurants is the first step to reducing the use of PHVOs in these establishments. Since food labels are not often provided at restaurants, this reduces the consumer's ability to properly determine their own level of trans fat intake and ability to avoid trans fat consumption

(Mozaffarian 2006). Therefore, reducing food served containing trans fat in restaurants is an important way to reduce trans fat consumption.

### **Work Cited**

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