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MINIMUM SOLIDS-NOT-FAT STANDARDS FOR FLUID MILK

Joe Outlaw, Ron Knutson, and Bud Schwart[*]

The Food and Drug Administration (FDA) sets standards of identity for beverage milk products. In the past, any state could mandate higher standards. Since 1962, California has added a higher minimum standard for nonfat solids (which are primarily milk sugar and protein) than are required by FDA. Advocates of higher national standards for solids-nonfat (SNF) have argued that the result would be increased milk consumption, increased sales of SNF and higher producer milk prices. Opposing interests point to higher ingredient and processing costs, higher product prices, and the fact that processors outside California have had the option of fortifying milk with SNF, but with limited success. The purpose of this leaflet is to explain the current state of knowledge regarding the SNF issue.

Milk Composition and the California Standards

Milk from the cow averages about 3.67 percent butterfat (BF) and 8.7 percent solids-not-fat (SNF) with variation seasonally, regionally, and among breeds. Federal FDA standards (Table 1) which must be adhered to in interstate trade and are thus used by default in most states require that:

- Whole fluid milk contains at least 3.25 percent BF and a minimum 8.25 percent SNF.
- Lowfat milk can range from 0.5 percent to 2 percent BF and contains a minimum 8.25 percent SNF.
- Skim milk contains less than 0.5 percent BF and a minimum 8.25 percent SNF.

While milk may be marketed with SNF content above these minima, only California maintains higher standards and has done so since 1962. These minimum California standards vary among products as follows (Table 1):

- Whole milk contains a minimum 3.5 percent BF and 8.7 percent SNF, with a 0.1 percent tolerance on BF and SNF as long as total solids are a minimum 12.2 percent (therefore, little, if any, fortification of whole milk is required).
- Two percent BF milk contains 2 percent BF and a minimum 10 percent SNF.
- One percent BF milk contains 1 percent BF and a minimum 11 percent SNF.
- Skim milk contains less than or equal to 0.25 percent BF and at least 9 percent SNF.

Proposals for higher federal minimum SNF standards have been introduced and seriously considered since 1982. Most of these proposals would adopt the California standards for SNF as federal minimum standards with some small

Table 1. Average Composition, Federal Standards and California Standards for Milk by Fluid Product Category.

Product	BF	SNF
	percent	
Raw Milk (FMMO Average)	3.62	8.7
Federal Standards		
Whole Milk	3.25	8.25
Lowfat Milk	0.5-2.0	8.25
Skim Milk	Less than 0.5	8.25
California Standards		
Whole Milk	3.5	8.7
2% Milk	2	10.0
1% Milk	1	11.0
Skim Milk	Less than 0.25	9.0

Source: Boynton, Robert and Richard Fallert, *Nationwide Adoption of the California Solids Standards for Fluid Milk Products*, (Washington, D.C., ERS/USDA), Staff Report AGES840816, August 1984.

[*]The authors are in the Department of Agricultural Economics at Texas A&M University and hold the positions of assistant research scientist, professor, and professor and extension economist, respectively. Dr. Knutson is also the Director of the Agricultural and Food Policy Center.

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differences. No change is proposed for the 3.25 percent minimum BF, a standard that is used in most states for whole milk. The remainder of this publication, which updates an earlier USDA publication of Boynton and Fallert, analyzes the adoption of the California SNF standards as an alternative to the current federal standards.

Rationale

Proponents of nationwide adoption of the California standards cite at least four reasons:

- **Uniformity in quality**. Higher minimum finished product standards, it is suggested, would create a more uniform quality product.
- **Consumption enhancement**. More uniform quality fluid products with higher nutritional value and improved taste are asserted to increase milk consumption.
- **Desire to eliminate surpluses**. Expanding demand for milk is one of the keys to eliminating dairy surpluses (see leaflet P-3). Higher minimum solids would certainly increase the demand for nonfat solids. Others have suggested that minimum standards could cause a temporary deficit of nonfat solids, an issue addressed further subsequently.
- **Compatibility with multiple component pricing.** Component pricing systems pay producers for milk based on its protein or SNF content and its BF content (See leaflet O-8). The solids content of raw milk can be changed through choice of breed, ration, management, and genetic selection. The argument is often advanced that a component price system would encourage milk producers to make changes in raw milk composition by creating price incentives for desired components. With adequate price incentive, setting higher SNF standards could encourage producers to breed and feed for SNF. In turn, the prices for each component would, theoretically, vary according to the changes in the demand for each component. For example, if consumer preferences favor higher minimum SNF in reduced fat products, component pricing would reward producers shipping milk high in SNF. Therefore, it is asserted that if minimum SNF standards are to be increased, adopting component pricing simultaneously would result in greater equity in pricing milk to processors and could, under a properly designed pricing system, provide incentives for producers to emphasize SNF production relative to BF. An important caveat is that there is no evidence of declining BF content of raw milk in California where component pricing has been used. However, this reflects a history of high BF price relative to SNF.

Both federal standards and the standards adopted by most states regulate only finished fluid and manufactured product standards. There are no regulations defining raw milk composition standards from the cow at the federal level or in most states. Therefore, outside California, the SNF content of beverage milk products varies with the SNF content of raw milk. The exception is the small share of milk that is explicitly and voluntarily fortified by processors, which is currently less than 7 percent (Table 2). Fat content tends to vary more than SNF but both can be affected by breed, climate, feed, and dairy herd management. The current fluid product standards are low enough to allow for variation in the SNF content of fluid milk products which affect nutritional content, taste, and body. However, the extent of consumers' perception of the variation in SNF content is not known.

Table 2. Per Capita Sales of Fortified Products in Federal Order Milk Markets.

	Fortified 2 Percent	Fortified 1 Percent	Fortified Skim	Fortified Total
	quarts			
1981	4.1	2.1	1.3	7.5
1982	3.9	1.7	1.1	6.7
1983	3.6	1.6	1.1	6.3
1984	3.6	1.5	1.1	6.2
1985	3.7	1.5	1.2	6.4
1986	3.9	1.4	1.4	6.7
1987	4.2	1.4	1.4	7.0
1988	3.8	1.2	1.6	6.6
1989	3.8	1.2	1.8	6.8
1990	3.3	1.2	2.0	6.5
1991	3.2	1.1	1.9	6.2

Source: USDA.

Under the current fat-skim pricing system practiced in most markets outside of California, solids-not-fat components are never explicitly considered in pricing fluid milk, because it is the skim portion that has value, not the solids *per se*. The skim milk portion is composed of the SNF components and water. Milk regulations forbid the dilution of milk received from producers. Every milk container is required to have a label indicating the SNF (protein and carbohydrate) content. Concern exists that adherence to these labels may not be uniform due to the natural variation in milk composition. Improved knowledge and assurance of SNF content could be provided by establishing minimum

standards, and by formalization of testing by federal milk order and state audits.

Available information from California suggests the composition of raw producer milk is not significantly different from milk received in other markets. California producers receive a per pound price for butterfat, a per pound price for SNF and a per pound price for liquid carrier. In recent years, the support price of SNF has been adjusted upward while the BF price has been adjusted down. Nonetheless, the price incentive for more SNF production relative to BF appears to be inadequate.

Impacts of California Standards on Milk Consumption

One of the main arguments in support of fortification is its supposed positive impact on the consumption of milk. If this is the case, opponents question, why do SNF-fortified fluid products appear to have problems competing in the unfettered marketplace? Table 2 indicates low per capita consumption of fortified milk — about 3 percent of total fluid consumption. Based on market experience, there is no statistically significant trend in the per capita consumption of fortified milk. For individual products, there is no statistically significant trend in the consumption of fortified two percent milk, although, currently, it is the largest fortified lowfat product category. While fortified skim milk has a statistically significant upward trend and 1 percent milk has a significant downward trend, in both cases, the market share is very small. Clearly, the unfettered market for fortified milk has not indicated strong consumer preferences for fortified milk. If there is an economic market niche for fortified milk, it is very small. However, it is possible, but not probable, that the lack of demand is due to a lack of general availability of the fortified product and a lack of knowledge regarding its existence. For example, the higher SNF product is frequently unavailable in the more popular gallon container.

Consistent with the above results, after comparing regional per capita consumption data from federal order markets with data for California, Boynton concluded, "There is no evidence that California's fluid milk standards are responsible for a significantly greater consumption or for a slowing of the rate of decline in per capita consumption." Table 3 indicates the percent change in whole, lowfat and skim milk consumption for selected regions and time periods often relied on for this conclusion. While this data is not decisive in separating out the cause-effect relationships, there is no real indication from these numbers that higher standards in California has been able to slow the rate of decline in consumption compared to other regions or the rest of the United States. While from 1980 to 1990 whole milk per capita consumption in California has not declined as much, it also experienced a smaller increase in lowfat and skim milk consumption than the rest of the country.

Table 3. Changes in Per Capita Fluid Milk Sales, 1970 to 1990.

	1970 to 1980			1980 to 1990			1970 to 1990		
	Whole	Lowfat & Skim	Total	Whole	Lowfat & Skim	Total	Whole	Lowfat & Skim	Total
	percent change								
California	-28	99	-4	-36	25	-12	-54	149	-16
All Markets[1]	-32	84	-9	-42	37	-11	-60	152	-19
Markets increasing consumption more than California[2]									
Central Arizona	-29	107	-2	-37	54	2	-56	219	0
North Atlantic	-25	139	-10	-34	76	-7	-51	321	-16
East North Central	-40	87	-11	-51	41	-7	-70	164	-18
Mountain	-29	80	-2	-36	43	0	-55	157	-2
Markets increasing consumption less than California									
Pacific Northwest	-42	63	-3	-44	32	3	-67	115	0
Great Basin	-29	62	9	-37	23	0	-55	99	9
West North Central	-48	72	-7	-55	34	1	-77	129	-7
South Atlantic	-26	109	-6	-51	7	-32	-64	123	-36
East South Central	-33	90	-8	-37	30	-9	-58	146	-16
West South Central	-14	25	-7	-34	83	-5	-44	128	-11

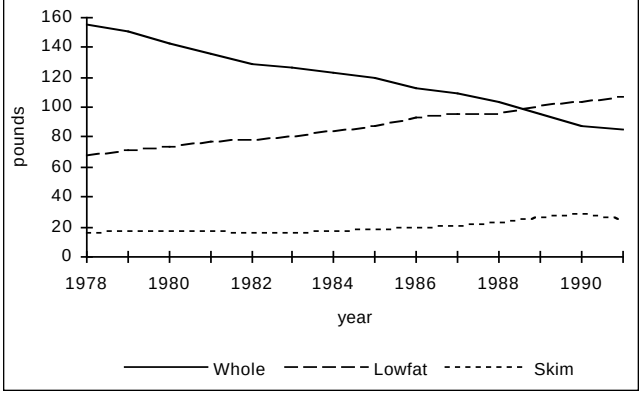
Source: Boynton, Robert, "Lessons Learned and Views from California," paper presented at Midwest Milk Marketing Conference (Des Moines), March 16, 1992.

[1] All Markets refers to all 44 Federal Milk Marketing Orders combined.

[2] Based off of percent change in lowfat milk, 1970 to 1990.

It is apparent that there must be other demographic and taste factors than SNF that affect milk consumption. Table 3 does not separate out the impacts of these other factors. The U.S. trend in per capita consumption for whole, lowfat and skim milk over the period 1978 to 1991 is indicated in Figure 1. California follows a very similar consumption pattern.

Figure 1. Per Capita Consumption of Fluid Milk in the United States, 1978 to 1991



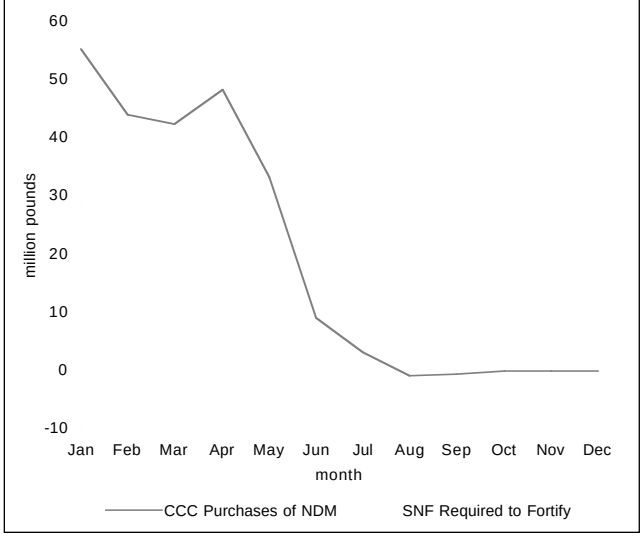
Impact of Application of California Standards on the SNF Supply-Demand Balance

It is estimated that an SNF deficit of 232.2 million pounds would have developed in 1991 if processors had been required to meet California standards. This estimate was derived utilizing the following steps:

- The first step involved subtracting the California usage of SNF in whole, lowfat, and skim milk (583.6 million pounds) from the total U.S. use of SNF (4,664.3 million pounds) in these products (Table 4). The result (4,080.7 million pounds) was the current use of SNF in fluid milk net of California.
- Second, current use of SNF outside of California (4,080.7 million pounds) was subtracted from the requirements for SNF with fortification (4,557.5 million pounds) at the California level. The result was a requirement for 476.8 million pounds of SNF to meet the California requirements nationwide.
- Third, ending CCC stocks of NDM and cheese contained 244.6 million pounds of SNF. These stocks presumably would not have been acquired if the California standards had been in effect but, instead, would have been used for fortification. Accordingly, the available 244.6 million pounds of SNF in NDM and cheese in CCC stocks were subtracted from the 476.8 million pounds of SNF required to meet the California standards to yield a potential SNF deficit of 232.2 million pounds.

In the end, regional and cyclical milk deficits complicate the problem of satisfying the needs for increased SNF. CCC purchases of SNF vary throughout the year with cyclical milk production patterns (Figure 2). CCC purchases could have exceeded SNF needs during the months of January-May 1991 even if the United States had adopted the California standards. In reality, if in 1991 the United States had been under the California standards, price would have rationed the available supplies. It is likely that the NDM would not have been sold to CCC, but would have been held privately in light of the pending deficit. The implication of potential regional and cyclical deficits is a higher price for skim milk concentrate and NDM that meets fortification requirements. Of course, when and if higher SNF standards were enacted, the supply-demand balance for SNF could be substantially different.

Figure 2. CCC Purchases of NDM and SNF Required to Fortify to Meet California Standards, Monthly, 1991



Consumer Cost Impacts

Per capita consumption trends are impacted by product costs. If fluid products are fortified then there would be an increase in the consumer price of these products. Processors will have to buy solids to add to fluid products in order to meet proposed standards. The California and U.S. experience with fortification are based on relatively small increases in SNF requirements relative to those which would exist with higher national standards (Tables 4 and 5). Accordingly, consumer cost impacts include two components:

- Increased costs based on current milk prices and costs.
- Increased costs based on higher milk prices resulting from the deficit—the magnitude of which would change over time.

Table 4. Estimated Butterfat (BF) and Solids-not-fat (SNF) Currently Used in Fluid Products for the United States, California, and Markets Outside California, 1991.

	Whole Milk		Lowfat Milk		Skim Milk		Total	
	BF	SNF	BF	SNF	BF	SNF	BF	SNF
	million pounds							
Total								
United States	703.3	1,808.3	486.8	2,314.4	31.2	541.6	1,221.3	4,664.3
California	100.5	249.9	54.7	273.6	1.7	60.1	156.9	583.6
Markets Outside California	602.8	1,558.4	432.1	2,040.8	29.5	481.5	1,064.4	4,080.7

Table 5. Estimated Solids-not-fat Requirements at California Solids Standards for Markets Outside of California.

	Whole Milk		Lowfat Milk		Skim Milk		Total	
	BF	SNF	BF	SNF	BF	SNF	BF	SNF
	million pounds							
Total Requirements of SNF	650.3	1,620.8	486.1	2,436.2	13.9	500.5	1,150.3	4,557.5
Current Use[1]	602.8	1,558.4	432.1	2,040.8	29.5	481.5	1,064.4	4,080.7
Needs for Fortification	47.5	62.4	54.0	395.4	-15.6	19.0	85.9	476.8

[1]From Table 4.

The first of these components is easier to measure while the second is more realistic and important from a policy perspective.

Current Cost Basis

Because more SNF are required to fortify lowfat milk than either whole or skim, the cost associated with lowfat milk fortification is considerably higher. Based on 1991 milk consumption and price data, the cost of ingredients alone utilized to fortify lowfat milk raises the price about $0.14/gallon while whole and skim milk prices are increased less than $0.03/gallon. These price increases are based on the assumption of an annual average price of $0.972 per pound of NDM. The total ingredient cost for fortifying the milk consumed in 1991 to meet California standards was estimated to be $463 million dollars or about $2.09 per person. Almost all (83 percent) of the cost would be from fortifying lowfat milk. Of course, there would also be marginally higher processing costs, including some additional capital investment.

Available estimates of elasticities of demand suggest that for each one percent increase in retail fluid milk prices, consumer demand declines 3/10ths of one percent. Certainly processors will be inclined to pass increases or increases in costs of non-fat solids through to retail consumers.

In 1991, the average price for whole milk was $1.37 per one half gallon, $1.31 for one half gallon of lowfat milk, and $1.26 per one half gallon of skim milk.[1] Without considering any taste impacts as a result of higher SNF costs, fortifying would increase the cost of lowfat milk by 9.2 percent, the cost of skim milk and whole milk by 2.4 percent and 2.2 percent. Demand for lowfat milk would decline only about 2.8 percent; demand for whole milk would decline about 0.66 percent, and demand for skim milk would decline 0.72 percent. Accordingly, the decline in demand for fluid products would free up an estimated 42 million pounds of SNF which could be used to only partially offset the SNF deficit.

[1] Whole and lowfat prices provided by USDA *Dairy Situation & Outlook* staff. Skim milk prices were estimated by the authors from USDA and federal order data.

Implications of SNF Deficit for Costs

Based on these results (Tables 4 and 5), had fortification of all U.S. milk to the California standards actually occurred during 1991, there probably would not have been any CCC purchases of NDM during the year and uncommitted CCC inventories would have been used up by September. By the end of 1991, over 200 million pounds of SNF would have been diverted from other disposition and used to fortify fluid milk.

Past experience indicates that the price of milk is very responsive to tight supply conditions. Therefore, assuming no change in imports of SNF, the demand for increased SNF would result in higher producer milk prices. Over time, producers would respond to higher milk prices by increasing production. No attempt was made to analyze either the magnitude of price impact or the time frame for producer response because of the complexity of both the demand response for individual products and the supply response.

The potential for SNF deficit suggests that if the California standards were to be adopted, it might be logical to consider implementing the requirements for higher solids in stages as a means of reducing the SNF deficit and moderating the price impact.

To fill the deficit, about 2.7 billion additional pounds of milk would need to be produced to generate 232 billion pounds of SNF. This increase in producer milk supplies would lead to 97 million additional pounds of butterfat. The increased butter production would presumably end up in the hands of the CCC. At the same time, with an increased price of NDM and skim concentrate, USDA could lower the butter price to make the U.S. competitive on world markets which could actually facilitate reducing stocks of both products.

Limitations

This analysis is not without limitations. Presently, processors in California do not fortify with NDM. Therefore, utilizing uncommitted inventories of NDM to measure the shortfall is not too realistic. However, since condensing is an intermediate process in producing NDM, the SNF available in NDM purchased into CCC inventories would have been diverted to fortification before being processed into NDM and subsequently sold to the CCC.

Another point that should be made deals with the quality of NDM in government storage. USDA estimates that all of the NDM in government storage is grade A, however, this is only an estimate. About 8 percent of the total milk supply is estimated to be grade B milk. Therefore, if one made the assumption that 92 percent of the uncommitted CCC inventories are grade A, then this would exacerbate the tight supplies of grade A SNF needed for fortification because grade B powder cannot be used to fortify. However, this would only be a short term phenomenon. Over time, grade A will gravitate to its highest value use. Today, the highest use is not NDM but, if it were, new supplies of grade A powder would quickly be made. In addition, milk production can be expected to be responsive to the increased demand. It is the milk supply-demand situation that exists when and if policy changes are made, not those that existed in 1991. New labeling requirements requiring an indication of nutritional composition such as total calories, carbohydrates, protein, and calories from fat could influence decisions regarding higher standards.

Table 6. SNF Deficit Based on the Estimated Additional SNF Requirements (Outside California) and SNF Contained in CCC Stocks, 1991.

	SNF
	— million pounds —
Additional Product Pounds Required	476.8
SNF Contained in CCC Stocks	244.6
SNF Deficit	232.2

Conclusions

Based on this discussion, the following observations can be made regarding adoption of the California standards and the SNF issue:

- There is little or no evidence to suggest that higher SNF requirements increase consumption of milk.
- However, the demand for SNF would increase because of the higher solids requirements.
- If new standards were adopted, initially, condensed skim would be diverted from other uses into fortification and then NDM would be drawn out of government stocks.
- In the short run, a deficit of SNF could develop, driving the price of milk up sharply.
- Staged implementation could be utilized to moderate the price impact and allow producers to respond by increasing supplies.
- In the longer run, wholesale prices of skim milk and its products would increase, tending to divert milk from other uses and increase production of skim milk products. With higher milk production comes the potential for more butter surpluses. However, higher market returns for SNF could facilitate USDA lowering its butter support price to levels competitive with world exporters, which in turn could lead to more U.S. exports and less sales to CCC. This also has implications for so-called class IIIA pricing and multiple component pricing. Long term, producer level markets will have to find a new equilibrium which may not be at a price much different from recent experience.