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THE ECONOMIC CONSEQUENCES OF FOOD CONTAMINATION: A CASE STUDY OF HEPTACHLOR CONTAMINATION OF OAHU MILK

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APPENDIX ONE

THE DATA

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Consumption

Monthly data on Oahu milk production and utilization are available only for aggregate forms of utilization. After the contamination, Class I utilization was corrected by several factors. First, the quantity of imports, recorded by the Division of Milk Control, was added. Second, route returns (milk returned from stores and other outlets) were estimated from data provided by one processor. It was assumed route returns reflect the market shares of each processor. Hence Meadow Gold with 59.5 percent of the pre-contamination market accounted for the same percentage of route returns. Foremost accounted for 40.5 percent. In those months when estimated returns exceeded the allowance for plant shrinkage and route returns, as set by the Division of Milk Control, Class I utilization was decreased by the excess returns.

Schools were supplied with imitation milk in the fall to avoid retail fresh milk shortages. To properly reflect quantity demanded, estimated school consumption of fresh milk, had supplies been ample, was added to utilization data. Schools usually received 7,000 gallons of milk a day (Harpham, 9/25/80). The numbers of school days (excluding holidays) in which imitation milk was served were 3 in September,

20 in October, 18 in November, and 13 in December. Calculation of total fresh fluid milk consumption is shown in Table A.1.

Population

On a given day, about 10 percent of the people in Hawaii are tourists. Hence, dividing consumption by resident population yields incorrect per capita figures. Tourist numbers vary with peaks in July and August, and a lesser peak in March. To estimate the number of tourists on Oahu by month, the number of westbound overnight and longer visitors to Oahu and their average length of stay on Oahu were obtained from the Hawaii Visitors Bureau. These data reflect the number of tourists from North America (about three-quarters of all tourists) arriving on Oahu and staying at least overnight. The average length of stay on Oahu for visitors from Asia or Oceania was unavailable, so the number of such tourists was not considered. It was assumed such tourists are not heavy milk drinkers. To calculate the average number of tourists on Oahu each month, the following equations from the Hawaii Visitors Bureau were employed:

$$\frac{\text{Number of Visitors per Month} \times \text{Average Length of Stay (days)}}{\text{Number of Visitor-Days per Month}} =$$

$$\frac{\text{Number of Visitor-Days per Month}}{\text{Days per Month}} = \text{Average Daily Visitor Census}$$

This was then added to monthly Oahu resident population, which was interpolated from annual data.

Price Data

Retail prices are sampled weekly on Oahu. Weekly raw data were obtained from the Market News Branch of the Hawaii Department of Agriculture, and the Honolulu Advertiser provided photocopies of its weekly "Retail Food Price Guide." Monthly prices were calculated from the weekly surveys of eight stores for half-gallons of whole and filled milk, and fruit nectar, a 14-quart package of nonfat dry milk, 46 ounces of canned fruit drink, and 12 ounces of canned soda. Often, only one observation was available per month; when there were more, an average was used. Gaps in data were filled by interpolation.

Gaps were minor except for nonfat dry milk and fruit drink when for 19 months (March 1979-October 1980) prices of an eight-quart package of nonfat dry milk and 12 ounces of fruit drink were surveyed. For nonfat dry milk, the 14-quart non-sale price before the interruption in the series was compared to the eight-quart non-sale price at the beginning of the gap. An index was calculated and the eight-quart price was adjusted to approximate the 14-quart price. A five-month gap remained for which prices were interpolated. Similarly for fruit drink, the 46-ounce non-sale price in October 1980 was compared with the non-sale 12-ounce price in the same month to devise an index by which to adjust the 12-ounce price.

Estimating the retail price of fruit nectar over a 20-month gap (February 1975-October 1980) was more difficult. The deflated price of fruit nectar (DPFN) was regressed on the fruit and vegetable component of the Honolulu CPI (CPIFV). Regression results were:

$$\text{DPFN} = 0.480 + 0.280 \text{ CPIFV} \\ (0.0618) \quad (0.0224)$$

$$\bar{R}^2 = 0.735 \quad \text{D.W.} = 1.266$$

Figures in parentheses are standard errors.

Although serial correlation was present, the estimators are unbiased. This equation was then used to estimate fruit nectar prices over the period of missing observations.

It should be noted that the Honolulu CPI is not seasonally adjusted. The Bureau of Labor Statistics does not adjust it because it is based on a small sample, so correcting for seasonality may introduce as much error as not adjusting it.

Table A.1.--Adjusted consumption (pounds), March 1982-June 1983.

	Class I Utilization	Excess Route Returns	Imports	Fall School Supply	Estimated Quantity Demanded
1983	MAR	4,372,720	0		4,443,670
	APR	1,394,566	43,241		1,460,827
	MAY	4,057,917	0		4,119,038
	JUN	5,317,541	10,079		5,342,576
	JUL	5,922,509	9,503		5,913,006
	AUG	6,098,039	0		6,098,039
	SEP	6,407,063	0	180,600	6,587,663
	OCT	6,166,634	41,633	1,204,000	7,344,481
	NOV	6,010,435	12,160	1,083,600	7,081,875
	DEC	6,359,002	0	782,600	7,199,652
	JAN	7,642,948	0		7,642,948
	FEB	6,960,393	0		6,960,393
	MAR	8,446,127	0		8,446,127
	APR	8,075,145	0		8,075,145
	MAY	8,416,879	49,235		8,367,644
	JUN	6,958,749	52,486		6,906,263

Table A.2.--Consumption, calendar composition adjustment factors, and milk dumped.

		Fluid Milk Consumption (Oz./Person/Day) ^a	Calendar Composition Adjustment Factor ^b	Milk Dumped (Pounds) ^a
1977	JAN	5.97342	0.9837	0
	FEB	5.80994	1.0000	0
	MAR	5.83109	1.0077	0
	APR	5.56503	1.0162	0
	MAY	5.90165	0.9790	0
	JUN	4.83096	1.0055	0
	JUL	4.93536	0.9844	0
	AUG	4.92175	1.0090	0
	SEP	6.07578	1.0157	0
	OCT	5.86075	0.9837	0
	NOV	5.90973	1.0011	0
	DEC	5.12989	1.0223	0
1978	JAN	5.85154	0.9823	0
	FEB	5.58569	1.0000	0
	MAR	5.64589	1.0129	0
	APR	6.17028	0.9751	0
	MAY	5.85454	1.0099	0
	JUN	5.03486	1.0147	0
	JUL	5.03781	0.9832	0
	AUG	5.07947	1.0094	0
	SEP	5.94753	1.0126	0
	OCT	5.93240	0.9823	0
	NOV	5.73423	1.0057	0
	DEC	5.63509	0.9833	0
1979	JAN	5.67742	1.0087	0
	FEB	5.83686	1.0000	0
	MAR	4.93947	1.2010	0
	APR	6.13927	0.9771	0
	MAY	5.84254	1.0098	0
	JUN	5.32830	1.0128	0
	JUL	5.16711	0.9839	0
	AUG	5.10002	1.0122	0
	SEP	5.75965	0.9743	0
	OCT	5.48121	1.0087	0
	NOV	5.13706	1.0167	0
	DEC	5.70715	0.9817	0

Table A.2.--Continued.

		Fluid Milk Consumption (Oz./Person/Day) ^a	Calendar Composition Adjustment Factor ^b	Milk Dumped (Pounds) ^a
1980	JAN	5.71371	1.0064	0
	FEB	5.72876	1.0485	0
	MAR	5.87161	0.9821	0
	APR	5.92405	1.0022	0
	MAY	5.73991	1.0187	0
	JUN	5.21007	0.9785	0
	JUL	4.94494	1.0064	0
	AUG	5.16567	0.9861	0
	SEP	5.60939	1.0118	0
	OCT	5.56231	1.0140	0
	NOV	5.61365	0.9737	0
	DEC	5.06627	1.0096	0
1981	JAN	5.45618	1.0187	0
	FEB	5.58524	1.0000	0
	MAR	5.25543	0.9831	0
	APR	5.69500	1.0025	0
	MAY	5.69917	0.9861	0
	JUN	4.78825	1.0118	0
	JUL	4.89074	1.0140	0
	AUG	4.96829	0.9821	0
	SEP	5.52542	1.0022	0
	OCT	5.27889	1.0187	0
	NOV	5.20056	0.9785	0
	DEC	4.88222	1.0064	0
1982	JAN	5.13185	0.9840	0
	FEB	5.08804	1.0000	0
	MAR	2.59754	1.0119	3,155,170
	APR	0.88405	1.0153	8,019,060
	MAY	2.50146	0.9822	5,938,650
	JUN	3.22787	1.0031	3,590,020
	JUL	3.39667	1.0178	2,825,120
	AUG	3.63138	0.9846	3,137,140
	SEP	4.07963	1.0018	2,009,870
	OCT	4.42498	0.9840	2,666,900
	NOV	4.26711	1.0148	1,958,750
	DEC	4.20177	1.0124	1,511,190

Table A.2.--Continued.

		Fluid Milk Consumption (Oz./Person/Day) ^a	Calendar Composition Adjustment Factor ^b	Milk Dumped (Pounds) ^a
1983	JAN	4.61417	0.9822	1,165,160
	FEB	4.52604	1.0000	811,148
	MAR	4.90825	1.0071	263,690
	APR	4.86581	1.0141	61,580
	MAY	5.00106	0.9846	31,820
	JUN	4.09559	1.0018	0

^aBased on data from the Hawaii Department of Agriculture, Division of Milk Control. Consumption adjusted as described in Appendix.

^bSource: Various issues of the Federal Milk Order Market Statistics (FMOS--221, 233, 243, 258, 285).

Table A.3.--Milk price, fruit nectar price, and consumer price index.

		Deflated Retail Fluid Milk Price (\$/1/2 Gal.) ^a	Deflated Fruit Nectar Price (\$/1/2 Gal.) ^a	Honolulu Consumer Price Index (1967=100) ^b
1977	JAN	0.649038	0.600962	1.664
	FEB	0.645161	0.603345	1.674
	MAR	0.647653	0.594177	1.683
	APR	0.650888	0.597633	1.690
	MAY	0.641932	0.594817	1.698
	JUN	0.651026	0.545455	1.705
	JUL	0.653061	0.530612	1.715
	AUG	0.643852	0.551044	1.724
	SEP	0.640138	0.582468	1.734
	OCT	0.638298	0.580794	1.739
	NOV	0.636468	0.579128	1.744
	DEC	0.634648	0.577473	1.749
1978	JAN	0.628895	0.577904	1.765
	FEB	0.623596	0.606742	1.780
	MAR	0.639955	0.612131	1.797
	APR	0.639471	0.622933	1.814
	MAY	0.635268	0.629792	1.826
	JUN	0.630778	0.625340	1.839
	JUL	0.633117	0.600649	1.848
	AUG	0.630388	0.581897	1.856
	SEP	0.625000	0.571581	1.872
	OCT	0.625000	0.577331	1.888
	NOV	0.621053	0.605263	1.900
	DEC	0.616832	0.601150	1.913
1979	JAN	0.603715	0.593395	1.938
	FEB	0.606524	0.606524	1.962
	MAR	0.625000	0.630040	1.984
	APR	0.612855	0.597907	2.007
	MAY	0.612043	0.587364	2.026
	JUN	0.616438	0.621331	2.044
	JUL	0.626822	0.612245	2.058
	AUG	0.627413	0.593629	2.072
	SEP	0.627395	0.589080	2.088
	OCT	0.627078	0.579572	2.105
	NOV	0.625294	0.578279	2.127
	DEC	0.619181	0.558659	2.148

Table A.3.--Continued.

		Deflated Retail Fluid Milk Price (\$/1/2 Gal.) ^a	Deflated Fruit Nectar Price (\$/1/2 Gal.) ^a	Honolulu Consumer Price Index (1967=100) ^b
1980	JAN	0.610652	0.550964	2.178
	FEB	0.602082	0.543232	2.209
	MAR	0.611062	0.544157	2.242
	APR	0.602463	0.532102	2.274
	MAY	0.606860	0.540897	2.274
	JUN	0.606593	0.545055	2.275
	JUL	0.603147	0.537587	2.288
	AUG	0.643199	0.547588	2.301
	SEP	0.636833	0.546472	2.324
	OCT	0.639386	0.575448	2.346
	NOV	0.641734	0.611985	2.353
	DEC	0.639560	0.614147	2.361
1981	JAN	0.629954	0.600751	2.397
	FEB	0.678175	0.591862	2.433
	MAR	0.668829	0.579651	2.467
	APR	0.660000	0.560000	2.500
	MAY	0.656325	0.536993	2.514
	JUN	0.648734	0.534019	2.528
	JUL	0.647821	0.530035	2.547
	AUG	0.643024	0.518316	2.566
	SEP	0.647538	0.387747	2.579
	OCT	0.644042	0.528346	2.593
	NOV	0.645286	0.568006	2.588
	DEC	0.646535	0.530391	2.583
1982	JAN	0.641814	0.511145	2.602
	FEB	0.637405	0.515267	2.620
	MAR	0.635948	0.521706	2.626
	APR	0.634258	0.516521	2.633
	MAY	0.597295	0.503381	2.662
	JUN	0.617100	0.371747	2.690
	JUL	0.616642	0.523774	2.692
	AUG	0.619896	0.530809	2.694
	SEP	0.613294	0.495777	2.723
	OCT	0.606831	0.505087	2.752
	NOV	0.612844	0.554128	2.725
	DEC	0.611338	0.566877	2.699

Table A.3.--Continued.

		Deflated Retail Fluid Milk Price (\$/1/2 Gal.) ^a	Deflated Fruit Nectar Price ^a (\$/1/2 Gal.) ^a	Honolulu Consumer Price Index (1967=100) ^b
1983	JAN	0.583486	0.535780	2.725
	FEB	0.600000	0.563636	2.750
	MAR	0.586957	0.514493	2.760
	APR	0.566787	0.516245	2.770
	MAY	0.564047	0.491266	2.748
	JUN	0.557594	0.502568	2.726

^aFrom the Hawaii Department of Agriculture, Market News Branch, and the Honolulu Advertiser weekly "Retail Food Price Guide."

^bBased on data from U.S. Department of Commerce, Bureau of Labor Statistics, CPI Detailed Report, various issues.

Table A.4.--Hawaii state personal income, resident population, and per capita personal income.

		Nominal State Personal Income ^a (Millions of Dollars)	Resident Population ^b	Deflated Per Capita Personal Income
1977	JAN	6548	909000	4329.04
	FEB	6653	910167	4366.58
	MAR	6758	911333	4406.13
	APR	6787	912500	4401.07
	MAY	6815	913667	4392.79
	JUN	6844	914833	4387.77
	JUL	6894	916000	4388.46
	AUG	6945	917083	4392.65
	SEP	6995	918167	4393.56
	OCT	7098	919250	4440.20
	NOV	7200	920333	4485.81
	DEC	7303	921417	4531.64
1978	JAN	7345	922500	4511.08
	FEB	7388	923583	4493.98
	MAR	7430	924667	4471.52
	APR	7490	925750	4460.16
	MAY	7549	926833	4460.54
	JUN	7609	927917	4458.99
	JUL	7713	929000	4492.68
	AUG	7816	930750	4524.53
	SEP	7920	932500	4537.02
	OCT	8004	934250	4537.76
	NOV	8087	936000	4547.35
	DEC	8171	937750	4554.84
1979	JAN	8231	939500	4520.66
	FEB	8291	941250	4489.55
	MAR	8351	943000	4463.60
	APR	8423	944750	4442.25
	MAY	8496	946500	4430.52
	JUN	8568	948250	4420.54
	JUL	8665	950000	4432.00
	AUG	8761	951583	4443.42
	SEP	8858	953167	4450.78
	OCT	8938	954750	4447.32
	NOV	9018	956333	4433.37
	DEC	9098	957917	4421.64

Table A.4.--Continued.

		Nominal State Personal Income ^a (Millions of Dollars)	Resident Population ^b	Deflated Per Capita Personal Income
1980	JAN	9276	959500	4438.72
	FEB	9453	961083	4452.59
	MAR	9631	962667	4462.31
	APR	9651	964250	4401.41
	MAY	9672	965833	4403.76
	JUN	9692	967417	4403.71
	JUL	9785	969000	4413.48
	AUG	9878	969833	4426.45
	SEP	9971	970667	4420.10
	OCT	10081	971500	4423.16
	NOV	10191	972333	4454.30
	DEC	10301	973167	4483.28
1981	JAN	10362	974000	4438.30
	FEB	10424	974833	4395.03
	MAR	10485	975667	4356.10
	APR	10547	976500	4320.33
	MAY	10608	977333	4317.43
	JUN	10670	978167	4314.94
	JUL	10774	979000	4320.81
	AUG	10877	980225	4324.41
	SEP	10981	981450	4338.33
	OCT	11057	982675	4339.35
	NOV	11134	983900	4372.56
	DEC	11210	985125	4405.45
1982	JAN	11239	986350	4379.15
	FEB	11268	987575	4354.87
	MAR	11297	988800	4350.71
	APR	11370	990025	4361.78
	MAY	11442	991250	4336.21
	JUN	11515	992475	4313.13
	JUL	11589	993700	4332.27
	AUG	11664	994975	4351.49
	SEP	11738	996250	4326.91
	OCT	11747	997525	4279.12
	NOV	11756	998800	4319.31
	DEC	11765	1000080	4358.69

Table A.4.--Continued.

		Nominal State Personal Income ^a (Millions of Dollars)	Resident Population ^b	Deflated Per Capita Personal Income
1983	JAN	11853	1001350	4343.86
	FEB	11940	1002630	4330.45
	MAR	12028	1003900	4341.04
	APR	12102	1005180	4346.46
	MAY	12176	1006450	4402.46
	JUN	12250	1007730	4459.32

^aBased on data from U.S. Department of Commerce, Bureau of Economic Analysis, Survey of Current Business, April 1983, October 1983, and January 1984.

^bBased on data from Hawaii, Department of Planning and Economic Development, State of Hawaii Data Book 1983.

Table A.5.--Visitors to Oahu, average length of stay, and average daily visitor census.^a

		Westbound Overnight and Longer Visitors	Average Length of Stay	Average Daily Visitor Census
1977	JAN	197940	6.03	38502.5
	FEB	188767	6.06	40854.6
	MAR	211506	5.77	39367.4
	APR	186099	5.66	35110.7
	MAY	162989	5.73	30126.7
	JUN	203772	6.06	41161.9
	JUL	218362	6.08	42827.1
	AUG	228109	5.88	43267.1
	SEP	160662	5.54	29668.9
	OCT	178760	5.94	34252.7
	NOV	162717	5.49	29777.2
	DEC	195630	6.32	39883.3
1978	JAN	197674	5.96	38004.4
	FEB	193618	6.02	41627.9
	MAR	226525	5.71	41724.4
	APR	185866	5.66	35066.7
	MAY	170781	5.55	30575.3
	JUN	217595	6.01	43591.5
	JUL	238373	6.15	47290.1
	AUG	235232	5.79	43935.3
	SEP	186228	5.47	33955.6
	OCT	213348	5.74	39503.8
	NOV	213608	5.71	40656.7
	DEC	216045	6.25	43557.5
1979	JAN	232118	6.12	45824.6
	FEB	225847	5.84	47105.2
	MAR	236688	5.70	43520.1
	APR	185714	5.54	34295.2
	MAY	161154	5.65	29371.6
	JUN	216684	6.10	44059.1
	JUL	247185	6.21	49516.7
	AUG	262311	5.87	49669.9
	SEP	188217	5.69	35698.5
	OCT	201564	5.78	37581.9
	NOV	182581	5.55	33777.5
	DEC	202654	6.14	40138.6

Table A.5.--Continued.

		Westbound Overnight and Longer Visitors	Average Length of Stay	Average Daily Visitor Census
1980	JAN	194093	5.98	37441.2
	FEB	195294	5.87	39530.2
	MAR	224540	5.68	41141.5
	APR	188490	5.52	34682.2
	MAY	177902	5.50	31563.3
	JUN	212831	5.88	41714.9
	JUL	263799	6.23	53015.1
	AUG	238713	5.79	44585.4
	SEP	154597	5.53	28497.4
	OCT	176023	5.62	31911.3
	NOV	172714	5.47	31491.5
	DEC	199741	6.24	40205.9
1981	JAN	181273	6.09	35611.4
	FEB	195612	5.80	40519.6
	MAR	196019	5.58	35283.4
	APR	187020	5.69	35471.5
	MAY	183508	5.54	32794.7
	JUN	225276	6.25	46932.5
	JUL	229850	6.27	46489.0
	AUG	257381	5.98	49649.6
	SEP	171610	5.79	33120.7
	OCT	190622	5.63	34619.4
	NOV	178100	5.74	34076.5
	DEC	202206	6.60	43050.3
1982	JAN	205932	6.23	41385.7
	FEB	218725	5.86	45776.0
	MAR	247247	5.68	45302.0
	APR	216120	5.61	40414.4
	MAY	200076	5.77	37240.0
	JUN	250069	6.05	50430.6
	JUL	267627	6.07	52403.1
	AUG	264963	5.75	49146.4
	SEP	194847	5.53	35916.8
	OCT	214040	5.54	38251.0
	NOV	218054	5.35	38886.3
	DEC	204955	5.93	39205.9

Table A.5.--Continued.

		Westbound Overnight and Longer Visitors	Average Length of Stay	Average Daily Visitor Census
1983	JAN	195057	5.62	35361.9
	FEB	214920	5.51	42293.2
	MAR	250658	5.48	44309.9
	APR	191806	5.47	34972.6
	MAY	209499	5.62	37980.1
	JUN	279346	6.06	56427.9

^aSource: Hawaii Visitors Bureau.

Table A.6.--Oahu resident population and de facto population.

		Oahu Resident Population ^a	De Facto Population
1977	JAN	729900	768403
	FEB	730550	771405
	MAR	731200	770567
	APR	731850	766961
	MAY	732500	762627
	JUN	733150	774312
	JUL	733800	776627
	AUG	734342	777609
	SEP	734883	764552
	OCT	735425	769678
	NOV	735967	765744
	DEC	736508	776391
1978	JAN	737050	775054
	FEB	737592	779220
	MAR	738133	779857
	APR	738675	773742
	MAY	739217	769792
	JUN	739758	783350
	JUL	740300	787590
	AUG	741442	785377
	SEP	742583	776539
	OCT	743725	783229
	NOV	744867	785524
	DEC	746008	789565
1979	JAN	747150	792975
	FEB	748292	795397
	MAR	749433	792953
	APR	750575	784870
	MAY	751717	781089
	JUN	752858	796917
	JUL	754000	803517
	AUG	754917	804587
	SEP	755833	791531
	OCT	756750	794332
	NOV	757667	791444
	DEC	758583	798722

Table A.6.--Continued.

		Oahu Resident Population ^a	De Facto Population
1980	JAN	759500	796941
	FEB	760417	799947
	MAR	761333	802475
	APR	762250	796932
	MAY	763167	794730
	JUN	764083	805798
	JUL	765000	818015
	AUG	765233	809818
	SEP	765467	793964
	OCT	765700	797611
	NOV	765933	797425
	DEC	766167	806373
1981	JAN	766400	802011
	FEB	766633	807153
	MAR	766867	802150
	APR	767100	802571
	MAY	767333	800128
	JUN	767567	814499
	JUL	767800	814289
	AUG	768417	818067
	SEP	769033	802154
	OCT	769650	804269
	NOV	770267	804343
	DEC	770883	813933
1982	JAN	771500	812886
	FEB	772117	817893
	MAR	772733	818035
	APR	773350	813764
	MAY	773967	811207
	JUN	774583	825014
	JUL	775200	827503
	AUG	776108	825254
	SEP	770017	805934
	OCT	777925	816176
	NOV	778833	817719
	DEC	779742	818948

Table A.6.--Continued.

		Oahu Resident Population ^a	De Facto Population
1983	JAN	780650	816012
	FEB	781558	823851
	MAR	782467	828776
	APR	783275	818248
	MAY	784283	822263
	JUN	785192	841520

^aBased on data from Hawaii Department of Planning and Economic Development, State of Hawaii Data Book 1983.

APPENDIX TWO

CONTENT ANALYSIS OF OAHU NEWSPAPER ARTICLES

APPENDIX TWO

CONTENT ANALYSIS OF OAHU NEWSPAPER ARTICLES

The purpose of this study was to determine how consumer awareness of milk safety affects fluid milk demand. To this end, variables representing information presented to the public about the contamination incident were included in the model.

Awareness of milk safety has three components: awareness of milk quality, the level of state protection of consumer health, and processor integrity. Milk quality refers to its physical characteristics, especially the presence or absence of harmful organisms or chemicals. The level of state protection of consumer health refers to the efforts and ability of the government to ensure a safe milk supply and keep adulterated products off the market. Processor integrity reflects concern and action taken by the processors to ensure safe milk. Awareness of milk safety may arise from friends, family, and the mass media. This study measured the amount and direction of information (positive, negative, or neutral) presented to the public by the mass media as a proxy for that from all sources.

Selection of the appropriate media was limited by the data available. Of the three major Oahu television networks, one cooperated by approximating the monthly number of news reports relating to milk

contamination aired from March 1982 through June 1983, as well as reports about the importation of Safeway milk from March through June 1983. Another station provided data only through 1982 while a third was uncooperative. These reports could not be coded whether they reported milk safety positively, negatively, or otherwise. The two major Oahu newspapers, The Honolulu Advertiser and The Honolulu Star-Bulletin, provided photocopies of articles related to milk and the contamination incident. Reports in the Final edition of the Advertiser and the Home edition of the Star-Bulletin were used since they are for home delivery on Oahu and street sales on Oahu and other islands. Relevant articles were those that mentioned "milk," "dairy," "heptachlor," or other contaminants (e.g., antibiotics, DDT) in the headline or first two paragraphs. An exception to this rule were those articles on dairy management-labor negotiations and federal milk fee assessments. These related more to business and labor unions than to milk safety and were excluded.

The analyst cannot assume that an article's content will affect all persons similarly. Hence, one cannot code the articles in terms of their effects on consumers (e.g., creates doubts about, or enhances confidence in milk safety). One can code the articles based on whether they present positive or negative information about milk safety more confidently, and this was pursued.

Articles were coded conservatively, from the viewpoint of a concerned consumer who accepts federal "action" (permissible) levels as safe until even federal agencies question their adequacy. Hence, the

announcement that heptachlor levels fell below the action level was coded positively. An exception to this was two articles announcing the discovery of DDT in nonviolative levels in milk. DDT is a more familiar poison, whose presence in even small amounts was considered negative information.

Mention of current wrongdoing was coded negatively; the direction of reports of past wrongdoing was more equivocal. Reports of unethical behavior ten years in the past probably do not affect awareness of current food product safety. Mention of such behavior within the past six to twelve months may affect awareness of food safety, but its specific effect is uncertain and varies between individuals. Mention of past contamination and wrongdoings by State officials or processors more than one month ago was not considered negative information. (The problem was identified and presumably corrected.) If, however, wrongdoings which had not been corrected were reported, it was coded negatively.

When uncertain about the direction of an article, each sentence was analyzed to determine whether it was positive, negative, or neutral information. Respective weightings were +1, -1, and zero. The article's headline was double counted. The sum of all coding determined how the article was coded. It was recognized that actions and statements by certain sources have more credibility and impact than those of others. Unfamiliar with Hawaiian officials, I did not attempt to account for this.

The following are the coding rules used. An article was coded as positive media coverage, or positive information about milk quality by mentioning:

- levels of contaminants below the action level that were previously above,
- how the presence of the contaminant was not harmful,
- government announcement that the crisis was over,
- government announcement that the dairy farms were clear of contamination,
- others' positive attitudes toward local milk.

Negative information about milk quality was mention of:

- current presence of contaminant in Oahu milk above the action level,
- dangers of the contaminant or uncertainty of the dangers,
- questioning of the adequacy of the action level by federal agencies,
- calls for a lower action level,
- product recall and banning on airlines,
- revelation of longer exposure period than originally suspected,
- doubts, suspicions of milk quality (e.g., about the length of exposure to contaminant),
- others' concerns about milk quality,
- presence of DDT, even below the action level.

Positive media coverage, or positive information concerning the current level of state protection of consumer health by ensuring safe milk supplies, was mention of the following:

- precautionary action taken to protect the public (e.g., recall when the health director suspected wrongdoing by Meadow Gold),
- the first milk recall for heptachlor (other recalls contradicted earlier assurances of safe milk supplies),
- recalls for antibiotics,
- testing and improvement of laboratory facilities,
- invitation of outside help (e.g., FDA expert),
- an investigation into the incident,
- lowering of the action level,
- state officials' certainty of milk safety (first time only),
- resignations ("The rascals are gone.").

Negative media coverage of the level of state protection involved:

- government allowance of violative levels of contaminants,
- government interest more in industry welfare than public safety (e.g., delay in recalling milk. This did not include denial of Safeway's license in 1983, which was seen as more a matter of protecting island business than a health matter.),
- revelation of past incompetence, or mixed priorities with no indication of correction,
- government statements proven false, contradictory lab results from other labs,

- inaction, indecision, confusion on the part of the State,
- accusations of a cover-up.

Positive information about processor integrity was:

- openness and cooperation with state officials,
- openness with public (e.g., creating a telephone answer line),
- voluntary action to ensure milk safety (e.g., independent testing),
- clearance from investigations.

Negative information was:

- lack of openness and cooperation with state officials,
- destruction of records,
- illegal or intentional use of contaminated milk within the past month,
- suspicions, investigations, and accusations made about both processors.

If only one processor was criticized, the article was coded neutral for processor integrity.

Each article was coded positive, negative, or neutral with respect to overall milk safety. Positive (negative) information about milk safety was positive (negative) information about milk quality, level of state protection, and processor integrity. Sometimes there was combination of positive and negative components of milk safety. Information on milk quality was of prime importance in determining the direction of the article with respect to milk safety. If milk on the shelf was known to be contaminated, awareness of milk safety would have

been negative, regardless of the level of State protection and processor integrity. The level of government protection was of secondary importance and overrode information about processor integrity. If the article reported unethical processor behavior and State action to correct it, the article was coded positively for overall milk safety.

To reflect the prominence editors give a story in terms of placement within the paper, position on the page, size of headline and length of story, Budd (1964) developed an "Attention Score." This was used (with slight modifications) to reflect the prominence of the article, and hence attention given it by the reader. Items were weighted as follows (taken from p. 260):

1. One point is assigned to any article with a headline two columns or more in width, except that an article carrying a headline that occupies horizontally more than half the number of columns of the page is assigned two points. [One point is assigned stories whose headline is to the side of the story.]
2. One point is assigned to any story appearing above the fold or above the measured center of any page. To be considered above the fold, the first line of the body text of the story has to appear above the fold.
3. One point is assigned to any article occupying three-fourths of a column or more (based on the column length of the newspaper concerned). For purposes of assigning the attention score, pictures accompanying articles are measured as part of the over-all length of the story.
4. One point is assigned for any article appearing on page one, the editorial page, or the front page of a section.

Hence an article may be scored between zero and five. Pictures and cartoons without an accompanying article are scored in the same manner. Pictures and cartoons accompanying an article are considered part of the story and are included in measurement of the article's overall length, as are the headlines.

Scores and confidence in them are given in Table B.1.

Table B.1.--Components of media coverage.^a

		NM	Average Confidence	PM	Average Confidence	NEUM	Average Confidence	TM
1982	MAR	92	3.5	34	3.5	52	3.6	178
	APR	122	3.6	60	3.6	54	3.7	236
	MAY	14	3.6	33	3.6	30	3.6	77
	JUN	6	3.4	5	3.4	13	4.0	24
	JUL	10	3.7	9	3.9	14	3.2	33
	AUG	85	3.4	11	3.2	8	3.8	104
	SEP	25	3.5	28	3.5	12	4.0	65
	OCT	6	3.5	12	3.5	7	3.9	25
	NOV	0		0		0		0
	DEC	18	3.8	9	3.8	16	3.5	43
1983	JAN	8	3.3	1	4.0	23	3.9	32
	FEB	8	3.3	5	3.7	19	3.7	32
	MAR	0		0		38	3.9	38
	APR	13	3.5	5	4.0	38	3.8	56
	MAY	16	3.6	14	3.9	84	3.9	114
	JUN	10	3.7	4	3.8	36	3.9	50

^aNM = Negative media
 PM = Positive media
 NEUM = Neutral media
 TM = Total media

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