

ON THE WORK DONE BY PUBLIC ANALYSTS DURING 1881 UNDER THE SALE OF FOOD AND DRUGS ACT.

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Read before the Society of Public Analysts, on 28th June, 1882.

A year ago I had the pleasure of summarising the returns made by Public Analysts as to the work done by them under the Sale of Food and Drugs Act during 1880, and of making some remarks on them; and I have now to bring before your notice another series of returns for 1881. These returns include the work of 78 Public Analysts, nearly all of whom are members of our Society; but a few who have not yet seen their way to join us, have been kind enough to favour us with the details of their work, so that the table might be made as complete as possible.

The object of this yearly summary is to point out the extent to which adulteration prevails year by year, earlier, and in a somewhat different way than it is reported in the blue books. These latter are, of course, issued at a later period of the year, and are arranged in a manner which does not enable us, as Public Analysts, to examine the facts contained in the various returns in the same way as we can in those we ourselves prepare.

Since the last paper on this subject appeared, very great steps have been taken, especially in the United States, towards the suppression of adulteration, and a number of different bills have been proposed in the various States, and most of them have been passed. The most satisfactory point in connection with them is, that nearly all contain what was originally proposed by this Society and pressed very strongly upon our own Government, viz., a distinct definition of adulteration, with limits or standards, showing what the constituents of any particular article are (according to the Act) expected to be. Had this course been followed in England, we should have been saved the annoyance which has been caused by the occasional contradiction of opinion between the Inland Revenue Chemists and the Public Analysts.

One very important publication in reference to adulteration has taken place during the past year, viz., the reports of the United States analysts who have, by the directions of the Government, examined the question of adulteration and its prevalence in almost all articles over the whole of the States. It is unnecessary to refer to that more fully, since the abstracts of the reports from the *Sanitary Engineer* (which is the official organ of the State Board of Health of New York) are being reprinted in *THE ANALYST* as rapidly as space will permit.

Several things have occurred lately to prove that the Sale of Food and Drugs Act needs further amendment; but in the present state of legislation it is, of course, quite impossible to hope for such a step this session, or even next.

Among the amendments which are essentially required, are the compulsory attendance of the referee chemists, whoever they may be, to verify their analysis on oath. It cannot be too well understood that their certificates at present *are not legal evidence*. Provision is also required for the compulsory collection of samples in larger numbers *pro rata* to the number of inhabitants.

Last year I mentioned that the probable number of samples examined was one out of every million samples purchased, and this year the number has fallen by a small fraction lower still. Taking only one illustration of the results of this imperfect examination of food supply, I may note that several of the larger dairymen supplying London absolutely reject milk, and fine the farmers who send it to them, when the standard falls down within 5 per cent. of as low as the Somerset House chemists are now passing, and if it falls within 8 per cent. of as low the farmer receives a notice couched in somewhat unpleasant terms. It is little wonder then that they, as well as we, should look upon such a "standard," if so it can be called, as a premium upon adulteration.

Passing now from a general view of the subject to the details, we have the following results. The number of returns received of samples analysed and reported upon during the last seven years have been as follows:—

Year.	Districts.			Samples Examined.	Samples Adulterated.	Percentage Adulterated.
1875-6	109	15989	..	18.10
1877	127	11943	..	17.70
1878	168	15107	..	16.58
1879	212	17574	..	17.25
1880	237	17919	..	17.47
1881	249	17868*	..	16.56

It will be noted that the returns this year are from 12 more districts than we had last year, and that the number of samples has been somewhat less. 1881 shows a slight diminution in the percentage of adulteration, as compared with 1880, from 17.47 to 16.56 — that is, after two years increase in percentage there is now a decrease—and the percentage is almost the same as it was in 1878. So far as appears from this, the good effect which the Act should have had has been, to a great extent, neutralized by its imperfect administration.

The following table shows the classification of the samples submitted to public analysts, including some few waters which, under arrangements which certain analysts have made, are included in the work they have to do under the Sale of Food Act. Dividing these articles into classes we have as follows:—

SAMPLES PURCHASED, 1879, 1880 AND 1881.

			Numbers.			Percentages.		
			1879.	1880.	1881.	1879.	1880.	1881.
Milk	..	..	6036	7251	6828	36.1	40.40	38.67
Butter	..	..	969	892	1081	5.7	4.97	5.86
Groceries	..	..	4197	3845	4328	25.0	21.48	24.17
Drugs	..	..	615	390	487	3.6	2.17	2.67
Wines, Spirits, and Beer	..	..	1615	2220	1967	9.7	12.36	10.86
Bread and Flour	..	..	1471	1326	1134	8.7	7.40	6.35
Water	..	..	1240	1604	1463	7.5	9.04	8.18
Sundries	..	..	629	391	580	3.7	2.18	3.24
			16,772	17,919	17,868	100.0	100.00	100.00

* The total in the tabulated statement is incorrectly put at 17808.

The figures in the last three columns show the percentage of samples purchased calculated upon the total.

In the following table the adulterated samples, which number 2,960 as against 3,132 last year, are classified with the corresponding figures for 1879 and 1880, the percentages being calculated upon the total number of samples found to be adulterated in each year.

SAMPLES FOUND ADULTERATED, OR IN THE CASE OF WATERS, UNFIT TO DRINK,
1879, 1880, AND 1881.

	Numbers.			Percentage.		
	1879	1880.	1881.	1879.	1880.	1881.
Milk	1332	1595	1379	44·72	50·98	45·30
Butter	135	179	137	4·53	5·73	4·65
Groceries	492	402	420	16·52	12·90	15·27
Drugs	164	79	93	5·52	2·52	3·16
Wines, Spirits, and Beer	457	480	471	15·36	15·18	16·00
Bread and Flour ..	68	84	48	2·28	2·68	1·63
Waters	266	287	383	8·93	9·18	13·01
Sundries	64	26	29	2·14	·83	·98
	2978	3132	2960	100 00	100·00	100·00

In this case it appears that the percentage of milk adulteration has fallen very slightly. Groceries show an increase as against the decrease of the previous year; bread and flour a decrease. In the case of water there is a large increase in the amount of impurity found.

It is more important to examine the percentage of adulteration as compared with the number of samples of each article purchased, and for this reason I have taken five consecutive years—viz.: 1877 to 1881—and calculated the percentage of adulteration as found in each year on each class of goods.

PERCENTAGES OF ADULTERATION FOUND FROM 1877 TO 1881, CALCULATED ON THE NUMBER
OF SAMPLES OF EACH CLASS ANALYSED.

	1877.	1878.	1879.	1880.	1881.
Milk	26·07	18·38	22·06	22·00	19·95
Butter	12·48	13·23	13·93	20·08	12·67
Groceries	13·03	12·89	11·73	10·43	9·70
Drugs	23·82	35·77	26·66	20·26	19·09
Wine, Spirits, and Beer..	47·00	29·31	28·30	21·31	23·94
Bread and Flour ..	6·84	2·97	4·62	6·33	4·23
Water	21·63	14·98	21·45	17·73	26·17
Sundries			10·17	6·66	5·00

This table is really the most important in the whole series, for it shows in what way the Act is working upon the vendors of different classes of goods. We find that milk still shows a fractional decrease in adulteration: it has not fallen down to the point reached in 1878, when the Act, if not worked more energetically than now, was certainly more of a terror to dairymen than at present, but 1879, 1880, and 1881, each show a small fractional decrease.

Butter has again fallen below the high figure which was reached last year and the comparatively high figures of the two previous years, and is down again almost to the point which it reached in 1877.

Groceries show a decided improvement.

Drugs show an improvement of more than 1 per cent, to be added to the 6 per cent. gain of the previous year.

Wines, spirits, and beer show a fractional improvement, which brings them almost to the average of 1879.

Now taking the samples examined in the Metropolitan district alone we get the following results:—The total number purchased was 2806, of which 398, or 14·21 per cent., were adulterated, this being as nearly as possible 1 per cent. less than last year. These samples are divided thus:—

METROPOLITAN DISTRICTS—PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	935	247	26·31
Butter	238	34	14·28
Groceries	856	68	7·94
Drugs	51	4	7·84
Wines, Spirits, and Beer	188	24	12·76
Bread and Flour	238	3	1·30
Waters	96	15	15·62
Sundries	204	3	1·47
	2,806	398	14·21

The only noticeable changes in this table from that which I gave last year are that the samples of butter show about 7 per cent. less adulteration, and those of wines, spirits, and beer about 6 per cent. more.

Next we have 153 Towns where 6,439 samples have been examined. This is about 700 less than was examined in almost the same number of towns during the previous year. The percentage of adulteration is 19·56 as against 17·87 last year.

TOWNS IN THE UNITED KINGDOM—PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	3721	742	19·94
Butter	298	64	21·47
Groceries	993	165	16·61
Drugs	78	11	14·10
Wines, Spirits, and Beer	361	89	24·65
Bread and Flour	325	12	3·69
Waters	513	166	32·35
Sundries	150	11	7·33
	6,439	1,260	19·56

In this case the notable changes are a fractional improvement of nearly 2 per cent. in the case of milk, about $4\frac{1}{2}$ per cent. improvement in butter, 10 per cent. in groceries, 6 per cent. in drugs, a deterioration in bread and flour, and a marked deterioration in the purity of water supplied for domestic use.

Passing from the towns to the counties we have reports from 74 counties and divisions of counties, as against 65 last year, with a total of about 500 more samples examined. The percentage of adulteration in these counties appears to have decreased from 17·84 to 15·09.

COUNTIES IN THE UNITED KINGDOM. PERCENTAGE OF ADULTERATION, 1881.

	Examined.	Adulterated.	Percentage.
Milk	2130	392	18·40
Butter	550	41	7·45
Groceries	2490	195	7·83
Drugs	364	79	28·34
Wines, Spirits and Beer	1427	355	24·87
Bread and Flour	552	29	5·24
Waters	880	208	23·63
Sundries	230	3	1·30
	8623	1302	15·09

Butter and groceries appear to be the articles to which the decrease is most due ; the adulteration of the former having decreased from 15·69 to 7·45, and the latter in almost equal proportion. "Sundries" show a marked decrease, but the number analysed is so small that it scarcely tells on the total.

The relative proportion of samples purchased in London, the large towns, and counties, show as follows :—London, 15·70 per cent. ; large towns, 36·04 per cent. ; counties, 48·26 per cent. ; and I now place before you a table which shows side by side the relative percentage of adulteration found in them.

METROPOLIS, TOWNS, AND COUNTIES.				PERCENTAGE OF ADULTERATION, 1881.			
		London.		Large Towns.		Counties.	Whole Country.
Milk	.. ..	26·31	..	19·94	..	18·40	.. 19·95
Butter	.. ..	14·28	..	21·47	..	7·45	.. 12·67
Groceries	.. ..	7·94	..	16·61	..	7·83	.. 9·70
Drugs	.. ..	7·84	..	14·10	..	28·34	.. 19·09
Wines, Spirits, and Beer	.. ..	12·76	..	24·65	..	24·87	.. 23·94
Bread and Flour	.. ..	1·30	..	3·69	..	5·24	.. 4·23
Waters	.. ..	15·62	..	32·35	..	23·63	.. 26·17
Sundries	.. ..	1·47	..	7·33	..	1·30	.. 5·00

I must leave these statistics to be examined, and the deductions to be drawn from them by others, except as regards one or two points. Milk adulteration remains as it always has done, one of the crying shames of the country. Probably it does not exceed the mark when I say that £100,000 a year is paid in the Metropolitan District alone for water which is sold at the price of milk. In this case the public are simply robbed, and the profit does not go to the Water Companies, but to the milkmen.

In the case of butter, which ranks almost next worse among the list of adulterations, it is, perhaps, more strictly correct to say that the public are cheated rather than robbed, because they get a "fat" of an inferior quality and slightly less palatable, but which is still "fat" in substitution for the butter which they intended to buy.

The low figure of the alcoholic strength of the wines, spirits, and beer may be passed over as before, on the ground that the public ought to be able to take care of themselves in *this* respect, and that probably it is quite as well that they can buy spirits of low alcoholic strength at a low price as strong spirits at an increased price.

As to drugs I can say nothing. It is true that the number of samples analysed is small, as it always has been since these returns have been made—487 only were examined last year—but certainly "druggists" should be above suspicion, and it is a sad thing to see the percentage of adulteration rise as high as 19·09 per cent. In my opinion it would have been far better had I been able to say that every one of these cases had been taken into court, so that, to put it in the mildest way, errors made by trained men might have been exposed.

The usual although very unpleasant sequence to my annual report is to point out that there are seven counties and 43 towns, besides one Metropolitan District—St. Martin's—in which the Act has been absolutely ignored, and nothing whatever was examined during the year. And in addition there are four counties and 26 towns where the amount of work performed has been utterly inadequate to the number of inhabitants, so that there are 80 counties, cities, and towns in the United Kingdom, and one important Metropolitan District, where the authorities have very successfully shown how "not to do it" in the way of complying with one of the most salutary Acts that has been passed during this generation.

As illustrations of the curiosities of adulteration I may add that Mr. Gatehouse reports marmalade and jam as containing saltpetre ; Mr. Stock, whisky containing capsicum ; Mr. Tatlock, skim milk containing chalk : and Mr. Allen, muffins containing plaster of Paris, and oatmeal containing chalk.

SOCIETY OF PUBLIC ANALYSTS.
Analyses of English Public Water Supplies in June, 1882. All results are expressed in GRAINS PER GALLON.

Description of Sample.	Date when drawn.	Appearance in Two-foot Tube.	Smell when heated to 100° Fahr.	Chlorine in Chlorides.	Phosphoric Acid in Phosphates.	Nitrogen in Nitrates.	Ammonia.	Albuminoid Ammonia.	Oxygen, Absorbed in		Hardness, Clark's Scale, in degrees.		Material dried at 220° Fahr.	Microscopical Examination of Deposit	ANALYSTS.
									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Kent Co.	May 30	c. p. blue	none	1.91	none	.16	trace	.0087	none	.006	21.2°	5.6°	33.4	vegetable debris	Wigner & Harland.
New River	June 14	clear	none	1.20	trace	.15	.0028	.0018	.017	.041	14.0°	3.5°	19.6	satisfactory	B. Dyer.
East London ..	" 9	c. yell. green	none	1.27	slight	.11	.0016	.0023	.014	.032	14.8°	3.0°	18.0	veg. deb., fibres, anml.	Wigner & Harland.
Southwark & Vauxhall ..	" 5	p. y. & clear	none	1.24	trace	.12	.0014	.0070	.023	.057	15.0°	4.0°	18.9	none	John Muter.
West Middlesex	" 21	f. yellow	none	1.08	trace	.11	.0015	.0062	.023	.042	12.5°	3.0°	18.0		O. Hehner.
Grand Junction	" 10	p. yellow	none	1.02	trace	.09	.0011	.0045	.010	.081	14.4°	3.3°	21.0		A. Wynter-Blyth.
Lambeth	" 5	p. y. & clear	none	1.24	trace	.12	.0014	.0070	.024	.062	16.0°	3.5°	18.9	none	John Muter.
Chelsea	" 19	c. p. brn. green	none	1.22	trace	.05	none	.0048	.022	.050	16.5°	4.5°	13.4		A. Dupré.
Birmingham ..	June 2	turb. grnsh.	none	1.33	trace	.13	.0014	.0022	.022	.078	9.8°	7.9°	20.7	veg. debris and forms	A. Hill.
Bolton	" 16	v. s. turb.	none	.40	none	.03	.0011	.0022	.010	.020	3.5°	3.5°	7.1	satisfactory	W. H. Watson.
Brighton	" 8	c. p. blue	none	1.97	none	.19	.0021	.0017	none	.008	13.6°	3.1°	20.4	veg. deb., fibres, anml.	Wigner & Harland.
Bristol	" 12	grnsh. brown	none	1.20	none	.06	.0005	.0025	.016	.025	17.5°	2.8°	22.0	sand, algæ	F. W. Stoddart.
Cambridge	" 19	c. p. blue	none	1.40	trace	.42	none	.0020	none	.016	18.0°	5.0°	24.8	satisfactory	J. West Knights.
Croydon	" 20	c. colourless	none	1.19	trace	.27	none	none	none	.007	15.0°	6.0°	22.4	none	C. Heisch.
Dublin	May 31	light yellow	none	.86	trace	trace	.0020	.0055	.063	.215	1.3°	.6°	4.4	satisfactory	C. A. Cameron.
Edinburgh	June 15	v. s. brown	none	.80	none	trace	.0008	.0036	.012	.038	4.2°	3.9°	4.8	none	J. Falconer King.
Exeter	" 12	f. b. yellow	none	.84	trace	.13	.0018	.0059	.038	.086	2.4°	2.4°	5.6		F. P. Perkins.
Grantham	" 21	c. p. blue	none	.81	trace	.34	.0006	.0006	none	.004	15.3°	3.3°	21.9	satisfactory	A. Ashby.
Hastings	" 15	p. grnsh. blue	none	4.50	trace	.12	.0014	.0035	.002	.008	7.5°	4.0°	22.7	v. slight	H. F. Cheshire.
King's Lynn ..	" 15	dirty yell.	weedy	1.28	trace	.32	none	.0112	.093	.305	14.5°	4.5°	23.8		W. Johnstone.
Liverpool	" 26	light green	none	1.02	trace	.03	.0014	.0049	.018	.066	3.5°	3.3°	7.2		A. Sneatham.

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									15 mins. at 80° Fahr.	4 hours at 80° Fahr.	Before Boiling.	After Boiling.			
Maidstone—															
Wtr. Company	June 14	p. green	none	2.50	trace	.71	.0042	.012	.030	.030	18.0°	7.0°	33.7		M. A. Adams.
Public Conduit	" 14	p. blue	none	2.30	trace	.68	.0014	.016	.031	.031	18.5°	7.0°	32.8		M. A. Adams.
Newark	" 19	c. p. blue	none	1.26	trace	.04	.0008	.013	.031	.031	17.2°	13.4°	36.0	satisfactory	A. Ashby.
Newcastle-on-Tyne.....}	" 8	f. yell. s. turb	none	.94	trace	.03	.0010	.061	.100	.100	13.4°	4.0°	16.5	satisfactory	J. Pattinson.
Nottingham ..	" 12	c. grnsh. blue	none	1.49	trace	.65	.0022	none	.028	.028	11.2°	6.7°	22.6	vegetable debris	Wigner & Harland.
Norwich	" 20	p. grnsh. yell.	none	1.80	trace	.08	.0070	.032	.052	.052	11.0°	3.7°	13.2	satisfactory	W. G. Crook.
Portsmouth ..	" 13	clear	none	1.15	trace	.18	none	.0063	.020	.020	12.2°	2.3°	18.5	veg. deb., diatoms	W. J. Sykes.
Rugby	" 2	c. p. yellow	none	1.68	trace	.02	.0110	.0142	.0595	.101	18.0°	8.5°	29.1	veg. deb., diatoms	A. P. Smith.
Salford	" 2	c. s. yellow	none	.70	none	none	.0007	.0017	.003	.027	3.0°	2.5°	4.0	none	J. Carter Bell.
Southampton..	" 24	c. p. yellow	none	.91	trace	.27	trace	.0110	.036	.036	12.2°	4.4°	20.6	veg. deb., diatoms	A. Angell.
Swansea	" 26	clear	none	1.00	trace	none	.0007	.0042	.003	.004	1.4°	1.4°	3.5	none	W. Morgan.
Whitehaven ..	" 13	c. f. green	none	.43	trace	.007	none	.0011	.015	.015	.4°	.4°	2.2	veg. deb., diatoms	A. Kitchin.

Abbreviations:—c., clear; f., faint; h., heavy; p., pale; v. h., very heavy; v. s., very slight.