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SEASONAL VARIATION OF AVERAGE GROWTH IN WEIGHT OF ELEMENTARY SCHOOL CHILDREN [1]

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In 1921, the United States Public Health Service, assisting in a health demonstration project at Hagerstown, Md., began an investigation of certain general problems connected with the physical growth of elementary school children. The results of various parts of the growth study will be published in a series of papers, of which this, the first of the series, will be limited to a consideration of the variations of growth in weight occurring coincident with changes of season. Information concerning the organization, methods, and other details of the health demonstration project will be found in recent volumes of the Public Health Reports. Attention is particularly directed, however, to two papers by Sydenstricker (1) and (2), which give detailed information relevant to the present study with regard to the social, economic, geographic, and demographic characteristics of the city of Hagerstown.

The basic material for the study consists of monthly weighings of approximately 2,500 native-born white children whose ages ranged from 6 to 16 years. This group represents the children enrolled in the eight elementary schools of the city. Weighings of the children were begun late in September and were repeated at approximately monthly intervals until late in May for each of the school years from (September) 1923 until (May) 1928.

The general plan for the selection of the children was as follows: During the first school year, 1923–24, the children in the first through the fourth grades attending the eight schools were weighed. The

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[2] The investigation during which the data used in this paper were collected was begun under the direction of Asst. Surg. Gen. Taliaferro Clark, formerly officer in charge of field investigations in child hygiene. The field observations were made under the immediate supervision of Passed Asst. Surg. R. B. Norment, Jr. The writer is indebted to these officers of the U. S. Public Health Service and to Acting Asst. Surg. E. Blanche Sterling, Senior Statistician S. D. Collins, Asst. Statistician Amanda Stoughton, and Miss Katherine Schindel, field worker, for assistance in the interpretation of the data. Grateful acknowledgment is made to Prof. L. J. Reed of The Johns Hopkins University for specific suggestions and criticism received during the preparation of the paper.

next year, 1924–25, the children in the second through the fifth grades attending the schools were weighed, and similarly, in each successive year, one lower grade was eliminated and one higher grade added. It was impossible to follow all of the children for the entire period, and an arbitrary decision was made to include in the present analysis records of only those children who presented at least 80 per cent complete protocols over a 4-year period. In the group of children studied, therefore, the selective factors were those differential elements which maintain or disturb the constancy of school populations throughout the elementary grades and the arbitrary factors introduced by dropping children not presenting fairly complete records for four out of five years.

The actual weighings of the children were made by one individual. Weights were taken in pounds to the nearest quarter pound. All weighings were made without shoes, vests, sweaters, or coats, but included the regular indoor clothing. It was not feasible to obtain nude weights, but, as will be seen later, some indirect evidence can be adduced to the effect that errors introduced by seasonal differences in clothing weights probably do not affect the major conclusions of the study. The day of weighing varied slightly from month to month and from year to year, and the time of day for successive weighings was not held rigorously constant. Certain corrections will be made for differences in number of days elapsing between monthly weighings, but no corrective account can be taken of the differences in time of day. In general, individual grades and individual children in each grade were weighed in the same order on the different weighing days; and, although considerable variability must be effected by lack of rigorous control of this factor, it is believed that, to a large extent, deviations will occur at random and will not greatly influence the general results of the study.

Since 1920 a great many papers have appeared which deal with seasonal and short-time cyclic manifestations of physical growth processes. It is of interest that the classical work of Malling-Hansen (3) has been reviewed no less than eight times during the past 12 years. The recent excellent monograph by Nylin (4) contains a comprehensive and unbiased review of the literature and a bibliography of 259 relevant titles. It will be considered sufficient in this report to refer to Nylin's paper, to state very briefly his conclusions, and to note the work which has appeared since his publication.

The consensus of informed opinion upon the question of seasonal variation of growth in weight affirms that growth proceeds at maximal rates during the late summer and autumn, continues at considerably reduced rates during the winter, and falls to minimal rates in the spring and early summer. This typical fluctuation has been observed in Danish children in Copenhagen, in Swedish children in Stockholm, in Scotch children in Aberdeen, in German children in Berlin, and in American children in Boston and New York. It is of interest to note, also, that growth in weight is accelerated in the fall (April, May, and June) and greatly reduced in the spring (October, November, and December) in children of English stock in Melbourne. This latter observation, which was reported by Fitt (5) in an infrequently quoted but important paper, furnishes evidence that the cyclic manifestation of physiologic activity is associated in some as yet unexplained manner with seasonal changes.

Working over the earlier data of Woodbury, by rigorous statistical methods Berkson (6) has adduced definitive evidence for a typical seasonal change of growth rates. Later, Orr and Clark (7) showed that the most rapid growth of weight occurs (in the Northern Hemisphere) during September, October, and November, and that the smallest increments are added during the spring and summer.

The observational data available for the present study were reduced by common statistical methods, and are presented in Tables 1 and 2. The methods of collecting these data over a period of years, on children of different ages, would permit an analysis of the growth of children of given age for different calendar years, but in this report it was decided to accumulate records of children of given age unspecified with respect to the year of measurement. This procedure was justified on the grounds that although convincing evidence (Martin (8), Hansen (9), Mumford (10), Paterson and Marsden (11), Jackson (12), and Wolff (13)) has accumulated which shows or suggests differences in growth in different calendar years, the seasonal trends, as previously reported, are of such size as quite completely to dominate any change in growth rates which may be expected to occur in successive calendar years.

TABLE 1.—*Constants* [1] *of frequency distributions of weight in October of a selected group of elementary school children, Hagerstown, Md., 1923–1927*

BOYS

Age group	6	7	8	9	10	11	12	13	14	15
Mean age Jan. 1 (years)	6.22	7.04	8.02	9.00	9.99	10.98	11.96	12.95	13.93	14.90
Number of children	238	597	840	978	993	869	681	465	256	91
Mean weight in October (pounds)	44.19	47.85	52.80	57.98	63.55	69.76	76.01	83.84	93.77	98.99
σ October weight (pounds)	4.75	5.77	7.00	7.76	9.60	11.30	13.26	15.80	19.12	18.08
β_1	0.0284	0.6023	0.9831	0.8757	2.1410	2.3731	2.0576	1.8809	0.9963	0.0401
β_2	2.8200	5.7969	5.7335	5.5789	8.8552	8.0339	7.2373	5.7732	4.4465	2.3166

GIRLS

Age group	6	7	8	9	10	11	12	13	14	15
Mean age Jan. 1 (years)	6.24	7.06	8.04	9.03	10.01	11.00	11.98	12.96	13.92	14.84
Number of children	237	573	811	921	925	798	614	415	220	67
Mean weight in October (pounds)	43.29	46.48	51.28	56.27	62.20	69.11	78.00	87.12	97.36	106.32
σ October weight (pounds)	5.10	5.59	6.66	8.16	9.99	12.54	15.48	16.82	18.20	19.80
β_1	1.0317	1.0547	1.2965	2.0722	2.5166	1.8560	1.4181	0.5714	0.5644	0.7470
β_2	6.0022	6.1411	6.1369	7.1693	7.9461	5.9464	5.7458	4.2627	4.8202	4.5420

[1] These constants furnish the data for a complete description of the distributions according to the Pearsonian system of frequency curves. The present paper only briefly mentions certain of the variability constants tabulated. A subsequent paper will consider the latter data in more detail.

Also, the increase in number of cases per year of age greatly stabilizes the statistical constants and materially smooths out the fluctuations due to random sampling. Tabulations were made, therefore, to show entries for each child for each year that he contributed to the study. Thus, if a child of 6 in 1923–24 was measured during each year of the study, he appears in the record of 6-year-old children (1923–24), in the record of 7-year-old children (1924–25), in the record of 8-year-old children (1925–26), and so on.

The children were grouped into age classes by single years of life, age being taken as of the birthday nearest to January 1. Under the headings of mean age in Table 1, the arithmetic average age of the children in each age class is shown. Although many recent writers fail to make such calculations, assuming the mean age to center at the midpoint of the class intervals, the necessity for taking account of this variable has been demonstrated by Boas (14), Schiotz (15), and others. Boas' data showed that the differences between mean ages of yearly classes were uniformly less than full years, and that the actual difference between the 5½ and 15½ year old classes was approximately 9.8 years rather than 10 years. The data presented in this report show a difference of approximately 8.6 years between the 6 and 15 year old classes. The latter difference, although small, is representative of approximately 3 pounds in weight, and obviously, if anthropological studies are to attain a high standard of accuracy, corrections for such differences must be made. The errors which inevitably seem to appear in statements of age of school children were reduced by requiring the actual date of birth to be recorded on each yearly protocol. Because at least four records were obtained for each child, age was verified with reasonable accuracy.

General features of the growth of this group of school children were determined by an analysis of the distributions, for each age class, of actual weights on the October weighing days. Table 1 shows, therefore, the mean, the standard deviation (σ), and the third and fourth moment constants (β_1 and β_2 in Pearson's notation) for the distributions of weight in October for each age group. For children of ages approximately 6, 7, and 8 years, weight was grouped in 2-pound intervals; for children of ages 9, 10, and 11 years, weight was grouped in 3-pound intervals; and for children from 12 through 16 years, weight was grouped in 4-pound intervals. Sheppard's corrections for the effect of grouping were not applied.

TABLE 2.—*Constants[1] of frequency distributions of weight increments, for given incremental periods, of a selected group of elementary school children, Hagerstown, Md., 1923–1927*

	Males, 6-year age group; average age Jan. 1, 6.22 years								
Number of cases	122	158	160	159	158	156	157	150	144
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.0	28.6	26.0	34.3	31.0	32.7	27.6	29.7	130.6
Midday, incremental period	(Oct.) 5.5	(Nov.) 2.8	(Dec.) 0.1	(Dec.) 30.2	(Feb.) 0.9	(Mar.) 4.7	(Apr.) 3.3	(May) 1.9	(July) 21.2
Mean gain (pounds)	0.80	0.76	0.15	0.32	0.44	0.55	0.27	0.11	1.13
σ (pounds)	0.82	0.85	0.93	0.99	0.91	0.88	0.77	0.79	----------
β_1	0.0279	0.0708	0.7205	0.8370	0.1303	0.0083	0.0005	0.0171	----------
β_2	4.1723	3.8553	6.1015	6.2774	3.7031	3.3472	3.1215	3.0757	----------

	Females, 6-year age group; average age Jan. 1, 6.24 years								
Number of cases	113	158	165	162	163	163	159	146	145
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	27.9	28.5	26.1	34.2	30.9	32.9	27.7	29.6	130.2
Midday, incremental period	(Oct.) 5.8	(Nov.) 3.0	(Dec.) 0.3	(Dec.) 30.4	(Feb.) 0.9	(Mar.) 4.8	(Apr.) 3.6	(May) 2.2	(July) 21.3
Mean gain (pounds)	0.90	0.77	0.16	0.30	0.48	0.33	0.33	0.13	1.04
σ (pounds)	0.87	0.84	0.91	0.99	0.93	0.90	0.96	1.00	----------
β_1	0.0125	0.0290	1.0098	0.4817	0.1368	0.0012	0.2014	0.1597	----------
β_2	2.7474	2.6754	5.7190	4.9526	5.6337	3.4463	6.8828	5.9722	----------

	Males, 7-year age group; average age Jan. 1, 7.04 years								
Number of cases	323	424	440	435	427	432	427	392	377
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.1	28.2	26.1	33.7	30.8	32.7	28.2	29.3	130.1
Midday, incremental period	(Oct.) 6.3	(Nov.) 3.2	(Dec.) 0.3	(Dec.) 30.2	(Feb.) 0.4	(Mar.) 4.2	(Apr.) 3.2	(May) 1.9	(July) 21.0
Mean gain (pounds)	0.91	0.68	0.26	0.57	0.48	0.46	0.20	0.15	1.44
σ (pounds)	0.98	0.97	0.90	0.91	0.92	0.94	0.87	0.90	----------
β_1	0.0155	0.0062	0.1983	0.1685	0.0593	0.1229	0.5068	0.0000	----------
β_2	3.6708	4.5014	6.6352	3.5993	5.2284	4.5759	5.6528	4.7565	----------

	Females, 7-year age group; average age Jan. 1, 7.06 years								
Number of cases	318	422	437	435	432	426	418	390	375
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.2	28.1	26.1	33.6	30.7	32.5	28.3	29.3	130.5
Midday, incremental period	(Oct.) 6.2	(Nov.) 3.2	(Dec.) 0.3	(Dec.) 30.1	(Feb.) 0.3	(Mar.) 3.9	(Apr.) 2.9	(May) 1.7	(July) 20.8
Mean gain (pounds)	0.98	0.78	0.30	0.42	0.41	0.50	0.17	0.05	1.49
σ (pounds)	1.04	0.94	0.92	0.98	0.96	0.91	0.87	0.85	----------
β_1	0.0410	0.0029	0.0026	0.1752	0.1406	0.0258	0.0286	0.0120	----------
β_2	5.7374	4.8669	3.8278	7.2700	6.9715	4.3062	3.7488	3.6965	----------

	Males, 8-year age group; average age Jan. 1, 8.02 years								
Number of cases	482	656	659	662	662	644	642	605	562
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.4	27.9	26.2	33.1	30.7	31.8	29.1	29.0	131.2
Midday, incremental period	(Oct.) 6.8	(Nov.) 2.7	(Nov.) 29.7	(Dec.) 29.4	(Jan.) 30.2	(Mar.) 2.4	(Apr.) 1.6	(May) 0.6	(July) 20.2
Mean gain (pounds)	0.98	0.85	0.33	0.61	0.51	0.52	0.40	−0.00	1.52
σ (pounds)	0.99	1.00	0.94	1.01	1.01	1.04	0.94	0.98	----------
β_1	0.0659	0.0223	0.0286	0.0027	0.0528	0.0422	0.0512	0.0063	----------
β_2	3.5469	4.1921	4.2068	4.1862	5.8575	5.3645	4.0788	3.9287	----------

	Females, 8-year age group; average age Jan. 1, 8.04 years								
Number of cases	442	633	639	641	636	626	621	599	555
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.2	28.0	26.2	33.3	30.7	31.7	29.1	29.0	131.3
Midday, incremental period	(Oct.) 6.7	(Nov.) 2.4	(Nov.) 29.5	(Dec.) 29.2	(Jan.) 30.2	(Mar.) 2.4	(Apr.) 1.5	(May) 0.5	(July) 20.1
Mean gain (pounds)	0.90	0.81	0.41	0.56	0.41	0.41	0.29	0.01	1.82
σ (pounds)	0.96	1.06	0.93	1.02	0.94	1.00	1.00	1.07	----------
β_1	0.0131	0.1365	0.0000	0.3071	0.0000	0.0367	0.2342	0.0012	----------
β_2	5.8356	4.5404	3.8374	5.3727	4.1701	4.0903	6.8680	4.9673	----------

[1] These constants furnish the data for a complete description of the distributions according to the Pearsonian system of frequency curves. The present paper only briefly mentions certain of the variability constants tabulated. A subsequent paper will consider the latter data in more detail.

TABLE 2.—*Constants of frequency distributions of weight increments, for given incremental periods, of a selected group of elementary school children, Hagerstown, Md., 1923–1927*—Continued

Males, 9-year age group; average age Jan. 1, 9 years

Number of cases	500	853	869	880	878	872	860	802	671
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.5	27.8	26.6	33.1	30.7	30.8	29.8	28.8	132.1
Midday, incremental period	(Oct.) 6.9	(Nov.) 0.9	(Nov.) 28.1	(Dec.) 27.9	(Jan.) 28.9	(Mar.) 0.6	(Mar.) 30.6	(Apr.) 28.9	(July) 19.6
Mean gain (pounds)	1.06	0.99	0.49	0.64	0.55	0.58	0.27	0.08	1.79
σ (pounds)	1.16	1.11	1.03	1.15	1.04	1.05	1.02	1.12	
β_1	0.1256	0.0047	0.0899	0.1813	0.0144	0.1341	0.0343	0.0855	
β_2	4.9875	5.7962	4.5750	5.5922	4.1864	4.4630	4.1981	5.5201	

Females, 9-year age group; average age Jan. 1, 9.03 years

Number of cases	496	813	827	824	827	826	814	752	633
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.6	27.8	26.7	33.1	30.7	30.7	29.9	28.8	132.3
Midday, incremental period	(Oct.) 6.8	(Nov.) 0.8	(Nov.) 28.0	(Dec.) 27.9	(Jan.) 28.7	(Mar.) 0.4	(Mar.) 30.4	(Apr.) 28.7	(July) 19.5
Mean gain (pounds)	1.04	0.94	0.45	0.64	0.42	0.52	0.25	0.04	2.19
σ (pounds)	1.03	1.02	1.07	1.20	1.11	1.03	1.01	1.01	
β_1	0.0029	0.0573	0.0055	0.0602	0.0031	0.0481	0.1488	0.0810	
β_2	3.9231	4.0583	4.6863	4.6547	4.9377	4.4958	4.7739	4.0404	

Males, 10-year age group; average age Jan. 1, 9.99 years

Number of cases	452	921	939	947	945	940	931	883	652
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.6	27.6	27.1	33.1	30.7	30.1	30.4	28.7	132.7
Midday, incremental period	(Oct.) 7.0	(Oct.) 30.5	(Nov.) 26.8	(Dec.) 26.9	(Jan.) 27.8	(Feb.) 27.2	(Mar.) 29.1	(Apr.) 27.7	(July) 19.2
Mean gain (pounds)	1.17	1.02	0.49	0.73	0.64	0.53	0.31	−0.01	2.06
σ (pounds)	1.19	1.15	1.13	1.17	1.15	1.16	1.11	1.13	
β_1	0.1071	0.0784	0.0019	0.0479	0.1481	0.0151	0.0463	0.0508	
β_2	4.7892	4.5949	3.5962	3.8755	5.3001	5.4528	5.0670	3.9125	

Females, 10-year age group; average age Jan. 1, 10.01 years

Number of cases	452	884	894	892	888	883	870	816	633
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.5	27.7	27.1	33.1	30.7	30.2	30.3	28.7	132.7
Midday, incremental period	(Oct.) 7.0	(Oct.) 30.6	(Nov.) 26.9	(Dec.) 27.0	(Jan.) 27.9	(Feb.) 27.4	(Mar.) 29.3	(Apr.) 27.8	(July) 19.2
Mean gain (pounds)	1.09	0.90	0.62	0.86	0.39	0.60	0.40	0.10	2.84
σ (pounds)	1.28	1.15	1.14	1.30	1.09	1.16	1.19	1.13	
β_1	0.0000	0.0030	0.0003	0.0885	0.0041	0.0183	0.0026	0.0082	
β_2	4.1705	4.5758	3.9521	4.5814	4.1578	4.4461	4.4403	3.5389	

Males, 11-year age group; average age Jan. 1, 10.98 years

Number of cases	347	825	841	857	859	851	833	775	538
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.6	27.4	27.5	32.9	30.6	29.7	31.0	28.5	133.0
Midday, incremental period	(Oct.) 7.6	(Oct.) 29.6	(Nov.) 26.1	(Dec.) 26.3	(Jan.) 27.1	(Feb.) 26.2	(Mar.) 28.2	(Apr.) 26.9	(July) 18.7
Mean gain (pounds)	1.16	0.96	0.65	0.79	0.56	0.66	0.38	0.02	2.27
σ (pounds)	1.27	1.25	1.24	1.28	1.26	1.21	1.18	1.26	
β_1	0.0717	0.1450	0.0544	0.0788	0.0056	0.0435	0.0564	0.0000	
β_2	4.1711	4.7826	3.9705	4.7178	4.5634	4.2551	3.6950	5.0817	

Females, 11-year age group; average age Jan. 1, 11 years

Number of cases	320	780	788	794	794	782	777	721	497
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.6	27.4	27.5	33.0	30.6	29.7	30.9	28.5	132.8
Midday, incremental period	(Oct.) 7.6	(Oct.) 29.6	(Nov.) 26.0	(Dec.) 26.3	(Jan.) 27.1	(Feb.) 26.2	(Mar.) 28.2	(Apr.) 26.9	(July) 18.8
Mean gain (pounds)	1.16	0.98	0.75	1.06	0.59	0.83	0.54	0.26	3.99
σ (pounds)	1.22	1.23	1.34	1.43	1.30	1.21	1.26	1.31	
β_1	0.0371	0.2008	0.0663	0.1503	0.0860	0.0220	0.0559	0.0967	
β_2	4.5724	4.3198	3.8941	3.4475	5.1551	3.6950	4.4246	4.7680	

	Males, 12-year age group; average age Jan. 1, 11.96 years								
Number of cases	232	660	676	683	675	664	648	594	349
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	29.1	27.3	27.8	32.9	30.6	28.9	31.5	28.3	134.3
Midday, incremental period	(Oct.) 7.7	(Oct.) 28.4	(Nov.) 24.9	(Dec.) 25.3	(Jan.) 26.0	(Feb.) 24.8	(Mar.) 26.6	(Apr.) 25.5	(July) 18.1
Mean gain (pounds)	1.34	1.09	0.82	1.01	0.73	0.79	0.43	0.07	3.25
σ (pounds)	1.60	1.30	1.31	1.48	1.42	1.32	1.35	1.35	
β_1	0.0230	0.1681	0.1883	0.2404	0.0188	0.0042	0.0045	0.0071	
β_2	3.7418	4.0614	3.3960	3.8789	4.2879	3.9186	4.1435	4.0368	

	Females, 12-year age group; average age Jan. 1, 11.98 years								
Number of cases	203	595	611	615	615	611	601	560	345
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	29.1	27.3	27.8	32.9	30.6	28.9	31.5	28.4	134.5
Midday, incremental period	(Oct.) 7.8	(Oct.) 28.4	(Nov.) 24.9	(Dec.) 25.2	(Jan.) 26.0	(Feb.) 24.7	(Mar.) 26.6	(Apr.) 25.5	(July) 18.9
Mean gain (pounds)	1.46	1.17	0.90	1.26	0.76	0.94	0.65	0.49	4.65
σ (pounds)	1.43	1.37	1.48	1.48	1.41	1.42	1.46	1.49	
β_1	0.0566	0.0139	0.0026	0.0211	0.0006	0.0147	0.0766	0.0006	
β_2	4.1375	4.0191	3.9050	3.6995	3.6948	4.3271	4.0160	3.7527	

	Males, 13-year age group; average age Jan. 1, 12.95 years								
Number of cases	95	439	462	471	470	463	453	413	200
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	28.9	27.2	28.4	33.2	30.6	28.4	31.9	28.3	134.9
Midday, incremental period	(Oct.) 8.1	(Oct.) 26.7	(Nov.) 23.5	(Dec.) 24.3	(Jan.) 25.2	(Feb.) 23.7	(Mar.) 25.4	(Apr.) 24.4	(July) 17.6
Mean gain (pounds)	1.64	1.30	0.96	1.22	0.95	1.05	0.55	0.30	3.60
σ (pounds)	1.38	1.51	1.51	1.54	1.50	1.52	1.44	1.63	
β_1	0.1996	0.0212	0.1636	0.0193	0.0286	0.0000	0.1019	0.0551	
β_2	2.7793	3.6611	4.2548	3.7829	4.1325	3.8926	4.0935	3.4580	

	Females, 13-year age group; average age Jan. 1, 12.96 years								
Number of cases	83	394	416	420	417	414	402	369	181
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	29.4	27.2	28.4	33.1	30.7	28.1	32.0	28.3	135.8
Midday, incremental period	(Oct.) 8.0	(Oct.) 26.4	(Nov.) 23.2	(Dec.) 23.9	(Jan.) 24.8	(Feb.) 23.2	(Mar.) 24.8	(Apr.) 24.0	(July) 17.1
Mean gain (pounds)	1.85	1.25	1.01	1.07	1.02	1.10	0.64	0.38	4.57
σ (pounds)	1.36	1.52	1.42	1.62	1.51	1.49	1.47	1.54	
β_1	0.0024	0.0021	0.0622	0.0028	0.0017	0.0154	0.0001	0.0761	
β_2	3.1754	4.1306	3.9021	3.1850	4.4700	3.7986	3.5228	3.1149	

	Males, 14-year age group; average age Jan. 1, 13.93 years								
Number of cases	40	237	255	256	256	247	242	219	70
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	30.1	26.7	29.2	33.0	30.5	28.0	32.6	28.1	136.1
Midday, incremental period	(Oct.) 8.0	(Oct.) 25.4	(Nov.) 22.4	(Dec.) 23.4	(Jan.) 24.2	(Feb.) 22.4	(Mar.) 24.1	(Apr.) 23.4	(July) 17.0
Mean gain (pounds)	2.03	1.56	1.17	1.59	1.25	1.22	0.75	0.59	4.48
σ (pounds)	1.85	1.40	1.64	1.81	1.56	1.53	1.52	1.67	
β_1	0.0023	0.2386	0.0175	0.0098	0.0115	0.0244	0.0496	0.0543	
β_2	3.0622	3.6648	3.8177	3.2691	3.5893	4.0011	3.6208	4.0715	

	Females, 14-year age group; average age Jan. 1, 13.92 years								
Number of cases	28	218	222	226	229	225	218	190	54
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	29.9	26.8	29.2	33.2	30.6	27.8	32.5	28.1	135.8
Midday, incremental period	(Oct.) 8.3	(Oct.) 25.0	(Nov.) 22.0	(Dec.) 23.2	(Jan.) 24.0	(Feb.) 22.2	(Mar.) 23.8	(Apr.) 23.2	(July) 17.1
Mean gain (pounds)	1.54	1.11	0.78	1.14	0.88	0.84	0.31	0.32	4.18
σ (pounds)	1.59	1.74	1.60	1.68	1.64	1.42	1.66	1.60	
β_1	0.8919	0.0081	0.0021	0.0245	0.0017	0.1164	0.0237	0.1399	
β_2	3.4905	3.3546	3.6133	3.1217	3.4413	3.7755	3.4566	3.6017	

Table 2.—*Constants of frequency distributions of weight increments, for given incremental periods, of a selected group of elementary school children, Hagerstown, Md., 1923–1927*—Continued

	Males, 15-year age group; average age Jan. 1, 14.90 years								
Number of cases	3	84	89	89	90	86	83	67	27
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	29.4	27.2	28.9	33.5	30.8	27.4	32.3	28.3	138.8
Midday, incremental period	(Oct.) 8.2	(Oct.) 24.6	(Nov.) 21.6	(Dec.) 22.8	(Jan.) 23.9	(Feb.) 22.0	(Mar.) 23.4	(Apr.) 22.7	(July) 15.6
Mean gain (pounds)	1.33	1.78	1.46	1.45	1.25	1.47	0.52	0.26	3.61
σ (pounds)	1.59	0.57	1.66	2.08	1.68	1.66	1.62	1.69	
β_1	0.2521	0.3764	0.4979	0.0157	0.1329	0.1267	0.1333	0.2229	
β_2	1.5000	4.5901	4.4459	3.0326	3.3282	2.5109	3.5169	5.2736	

	Females, 15-year age group; average age Jan. 1, 14.84 years								
Number of cases	6	68	69	69	71	70	67	58	17
Incremental period	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May	Summer
Average number days, incremental period	30.5	26.9	29.4	33.3	30.6	27.5	32.7	28.2	137.9
Midday, incremental period	(Oct.) 8.1	(Oct.) 24.2	(Nov.) 21.3	(Dec.) 22.6	(Jan.) 23.6	(Feb.) 21.6	(Mar.) 23.1	(Apr.) 22.5	(July) 16.0
Mean gain (pounds)	1.38	0.82	0.68	0.97	0.57	0.95	0.12	0.22	4.08
σ (pounds)	1.14	1.74	1.73	1.80	1.60	1.70	1.29	1.75	
β_1	1.5736	0.1044	0.0679	0.0264	0.0484	0.3317	0.0495	0.1156	
β_2	3.3182	2.9940	2.6768	3.9965	3.3956	3.5389	3.4221	3.1642	

It was believed that the short-time variations of growth could be studied most efficiently by expressing changes of weights as monthly gains or increments. Table 2 shows, therefore, the mean, the standard deviation, and the third and fourth moment constants (β_1 and β_2) of distributions of monthly increments for each month from October to May and for distributions of summer increments calculated as the difference between the September weighing and the previous May weighing. Increments were grouped in quarter-pound classes for the analysis of the distributions. For the purposes of description, monthly increments were assigned to the month in which the second weighing was made. For example, the increment found by subtracting the weight of a child on December 18 from his weight on November 14 was designated the December increment. Increments were calculated by arithmetic interpolation in those cases where monthly weighings were, for any reason, not observed. If more than two monthly weighings were omitted, the increments were tabulated as unknown. No observations were discarded, although gains, as great as 10 pounds for single months, were occasionally encountered. Sheppard's corrections for the effect of grouping were not applied. It should be clearly understood that the means of these distributions, denoted in the table as *mean increments*, represent the *average gain in weight per child per time-interval.*

The variation in number of days between successive weighings makes it necessary to give, for each interval, the average number of days between weighings. These averages are the simple differences, in days, between successive arithmetic mean monthly weighing days. It is implicitly assumed by this method of correcting for differences in the number of days between weighings that growth over the period concerned may be represented by an arithmetic progression. The same assumption has been made by Boas (14), who gives a full algebraic formulation of the problem and justifies the assumption.

No variability constants accompany the average number of days per interval, as the frequency distributions of days are extremely skewed, and the use of any common measure of variability can not be readily justified. It may be stated, however, that the ranges of dispersion of these distributions do not exceed 10 days. In order to allocate precisely the growth periods, the day midway between average weighing days is also recorded.

Certain results evident from Table 2 are shown graphically in Figure 1. The graph gives, for each sex, the mean monthly gains or rates of growth per month from the sixth through the fourteenth year of age. The monthly gains[3] in every case were reduced to a 30-day basis. The method of reduction was simply to divide the average

[3] Publication limitations do not permit the tabulation of the calculated 30-day values, but these may be obtained or verified from the basic data in Table 2.

gain for the interval under consideration by the average number of days in that interval and to multiply the resulting quotient by 30. The monthly gains for the summer periods were based upon growth intervals of approximately three and one-third months' duration, but for purposes of comparison, reductions also were made to the 30-day basis.

It will be seen that at every age for both boys and girls the growth rates are at a maximum for the periods centering about October 6. The rates for November show a sharp reduction for every class. About December 1, growth is reduced from one-third to one-half of the November value, and the January, February, and March rates generally follow, with some fluctuations, horizontal or slightly down-

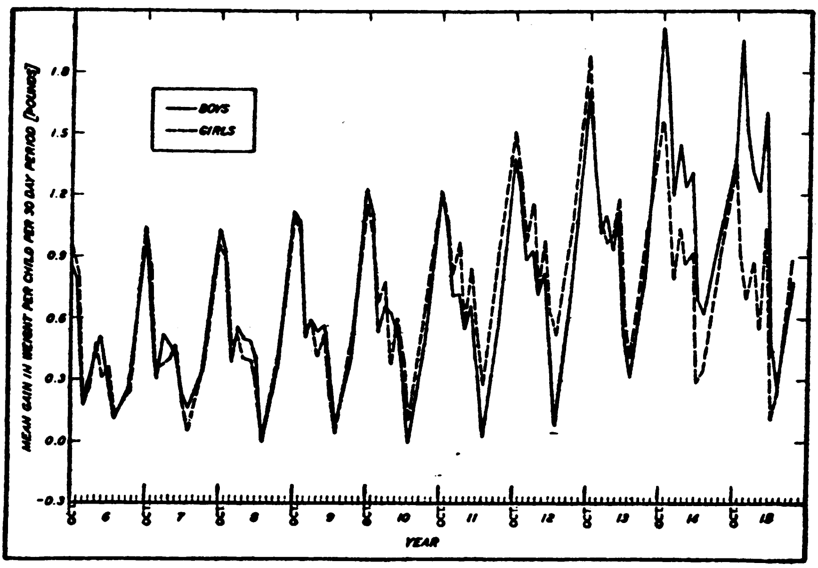

FIGURE 1.—Seasonal variation of average monthly growth rates, as observed in yearly age groups of elementary school children, Hagerstown, Md.

ward trends. The April gains show a reduction to approximately one-half of the winter values, and the May increments drop to a very low minimum. The average rates for the summer show a definite rise, in most cases closely approaching those of March 1. The summer rates are not precisely comparable with the preceding monthly rates, and very probably represent continued slow growth during June and, likely, July, followed by a fairly sharp rise during August and September. The seasonal trend is similar for all age groups, the older children showing, perhaps, slightly more marked relative changes, but the essential character of the curve is typical for every age and for both sexes.

The question may be raised that the large gains in weight observed in the fall and the small gains recorded for the spring may be effected by seasonal changes of clothing weights. It must be remembered, in this connection, that the children were weighed without shoes, coats, vest, sweaters, or outdoor wraps. The usual clothing worn during the weighing consisted, for girls, of underwear, stockings, slip, and dress; for boys, of underwear, stockings, shirt, and trousers. It may be stated, as the considered opinion of those workers who collected the data, that for many of the children neither the quality nor quantity *of the garments under discussion* varied during the school year. To be sure, some of the children wore heavier stockings and underwear, and some of them wore heavier outer garments during the colder months of the year. In general, such garments appeared in November, although many were worn only during December, January, and February. It is reported as uncommon to find so-called "winter" clothing on the school children of Hagerstown after April 15. There is, therefore, good evidence that neither maximal nor minimal rates of growth fall at the times of greatest clothing changes.

A further point bearing on the interpretation of the curves of Figure 1 as representative of true seasonal variations in growth increments may be made. Maximal growth periods were observed for the months ending, on the average, October 15 and November 15. During these months, growth rates were approximately 0.6 pound per child (in the 6-year-old children) to 1.0 pound per child (in the 14-year-old children) per month greater than the growth rates for the winter months. An attempt to attribute the higher rates for October and November to changes in clothing weights must assume that the weight of clothing of the average child increases from 1.2 to 2.0 pounds from September 15 to November 15. Further, if the deceleration in growth during April and May is to be attributed to clothing changes, it must be assumed that the clothing weight of the average child decreases from approximately 0.8 pound (in 6-year-old children) to 1.5 pounds (in 14-year-old children) from March 15 to May 15. The sum of these values implies an average variation in weight of clothing of 2.0 pounds (in 6-year-old children) to 3.5 pounds (in 14-year-old children). It must be understood that these values are not postulated weights of the clothes themselves, but postulated *variation* in the weight of the clothes. It will be evident to those familiar with weights of children's clothes that such average variations are exceedingly unlikely to occur.

If the graph in Figure 1 is regarded as a continuous curve from the sixth through the fifteenth year, it is seen that the difference between the rates for boys and girls fluctuates irregularly from month to month until the end of the seventh year. During the next two years, except for 4 of the 18 intervals, the rates of growth are higher for boys than for girls. The differences were not found to be individually statistically significant,[4] in spite of the size of the samples dealt with; and although no great stress is placed upon this point, it is at least suggestive that during the eighth and ninth years boys grow at slightly greater rates than girls. In March of the tenth year, the rate for girls rises above that for boys, and from this time until autumn of the thirteenth year girls grow more rapidly than boys. It is to be observed that the growth of girls is very markedly increased over the growth of boys during the spring and summer of the tenth, eleventh, twelfth, and thirteenth years. By the beginning (October) of the fourteenth year, the monthly rates for the boys rise sharply above those for girls, and continue at greatly increased values until the close of the fifteenth year.

The characteristic sex differences of the so-called "adolescent acceleration" of growth have been discussed extensively in the literature of physical anthropology. As far as is known, however, a differential sex difference with respect to season has not been observed. Although conclusions must be drawn with considerable caution, the data in this report indicate that, although girls grow more rapidly than boys during the whole interval from the tenth to the fourteenth year, it is principally during the spring and summer that the velocities of growth for girls greatly exceed those for boys. Further, it is indicated that, although boys grow more rapidly than girls during the fourteenth and fifteenth years, it is principally during the fall and winter that rates for boys greatly surpass those for girls. Considerations of why these particular sex differences appear are, at present, only speculative. It may be suggested that boys exercise more vigorously in the spring and summer, and therefore gain relatively less in weight. Gray (16), Mumford (17), Schwartz (18), and many others, however, have shown that regulated exercises are conducive to large and rapid gains in weight. It may be argued that differences in clothing weight of the sexes would produce the observed variation. Although this can not be clearly contradicted, the consistently higher gain of girls during the entire spring and summer, and of boys during the entire autumn and winter seasons makes the validity of the criticism reasonably doubtful.

Figure 2 presents the same basic material as is shown in Figure 1, but in this case the rates are plotted for specific months of the year.

If the trends for separate months for boys from the sixth to the eleventh year only are considered, it will be observed that during October, November, and December there is a rapid increase in monthly growth rates; for the months of January, February, March,

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[4] For the analysis of the significance of the difference of rates, the standard deviation of a 30-day period was obtained by arithmetic interpolation. This is equivalent to a scale change, and the corrected standard deviation obtained is taken only as a close approximation of the standard deviation of a distribution of increments for exactly 30-day intervals.

and also for the summer interval, the rates increase definitely, but more slowly; during April and May there is very little age change in the rates. In general, these trends are linear; i. e., when straight lines were fitted to the monthly rates for this segment of the growth period, it was found that no rate deviated more than three and one-half times its probable error from the appropriate fitted straight line. The importance of this finding is enhanced by the discussion which has arisen in recent literature (Davenport (19), Todd (20), and others) regarding what has been termed the "pre-adolescent slump" or "adolescent lag" of growth. This phenomenon is said to occur

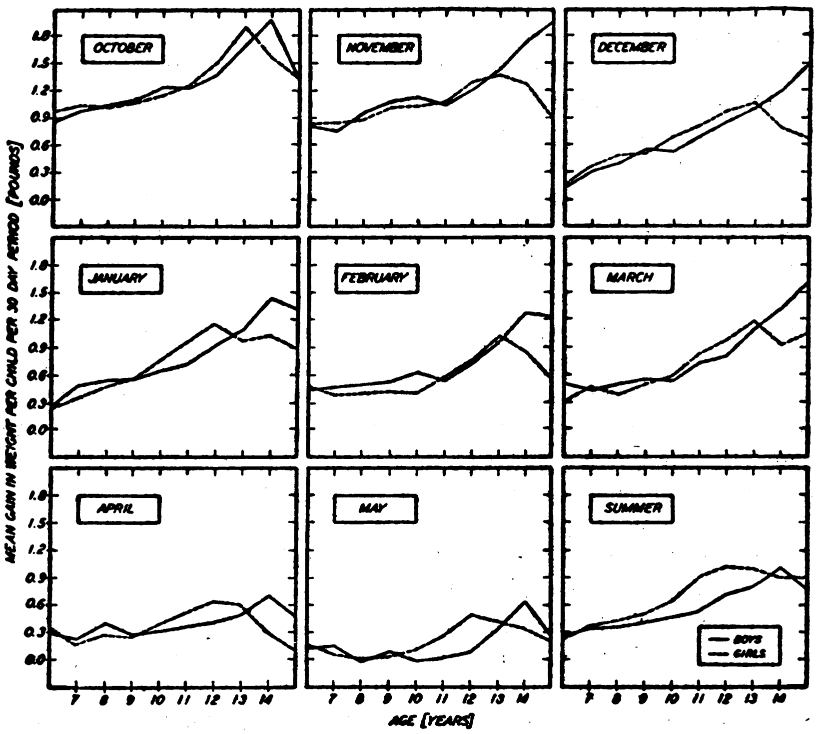

FIGURE 2.—Variation of average growth rates with age during specific periods of the year, as observed in yearly age groups of elementary school children, Hagerstown, Md.

during the tenth to the twelfth year and to be pronounced only in boys. It is not found in all data; and as far as can be ascertained from the literature available, none of its proponents has tested, by quantitative methods, the significance of the difference of growth rates. Its presence necessarily postulates that the slope of the actual growth curve be less during the "slump" period than just previous to that period. One method of determining the characteristics of the phenomenon would be to study the rate of change of the curve of growth in weight at frequent intervals immediately preceding and during the postulated acceleration. Such rate constants of the growth curve are furnished in this study by the average gains during successive months. The analysis given thus far shows that these rates of growth from the sixth to the eleventh year follow linear trends with positive slopes. This fact must be interpreted as meaning that average growth itself is following a constant positively accelerated course.

To continue the analysis further, it may be observed that during the twelfth year the monthly rates for boys show sudden marked increases for nearly every month. In fact, every rate for the twelfth year lies above the straight lines fitted to the rates of the previous six years (five of the nine specific rates are three or more times their probable errors above the fitted lines). The rates for the different months of the thirteenth and fourteenth years show the rapid acceleration of growth characteristic of this period of development. By the fifteenth year the majority of the rates for boys are reduced, and it is evident that the maximum point of the "adolescent acceleration" has been passed. The age limitation of these data makes it impossible to continue the analysis further or to compare the curve of rising rates with the curve of falling rates.

In summary of this phase of the study it may be stated that average growth in weight of boys follows a constant positively accelerated trend from the sixth through the eleventh year. Beginning abruptly in the twelfth year and continuing to a maximum in the fourteenth year, growth is very markedly accelerated. During the fifteenth year, growth rates generally decrease. There is no statistically significant evidence in these data of a pre-adolescent "slump" or "lag" of growth in weight.

Changes of the monthly growth rates for girls (fig. 2) present certain of the same characteristics that were observed in boys. Growth rates during the separate months of the sixth to the tenth year, with the exception of February and May, follow fairly regular upward trends. In the spring and summer of the ninth year, however, there is evidence of an acceleration of growth. During the tenth year this acceleration becomes quite general, except for October and November, which months do not show a pronounced increase until the eleventh year. It would appear as an important finding that the phase of accelerated growth in girls begins gradually, and that not until the third year after its inception does it appear to persist through every month of the year. For the periods January, April, May, and the summer, maximum growth rates are found in the twelfth year. During the months of October, November, December, February, and March, the highest rates are found in the thirteenth year. Attention thus is directed again to the fact that the "adolescent acceleration" in girls tends to begin at an earlier age and to reach a maximum at an earlier age during the spring and summer than during the fall and winter.

The fourteenth year is marked by a deceleration, and by the fifteenth year the velocity of growth is very much reduced.

It will be observed that for certain periods, October, November, February, and for the summer, the deceleration of growth following the maximum point is fairly symmetrical with the acceleration before the maximum point. For the other months there is some irregularity in the rise and fall of the rates. For December and April the velocities of growth show gradual increases from the ninth to the thirteenth year, followed by sharp decreases in the fourteenth and fifteenth years. The months of January, March, and May, on the other hand, show more rapid acceleration of growth prior to the maximum, followed by less marked declines during the fourteenth and fifteenth years. These fluctuations for the different months appear not to follow a systematic trend; and although no definite statistical analysis of the form of the ascending and descending limbs of the velocity curves has been made, it seems reasonable to believe that, for girls, the pubescent change in growth rates is, on the average, a fairly symmetrical process. It is more likely, perhaps, that if the data were combined to give average *yearly* growth rates, a fairly smooth symmetrical curve would result. These findings may be considered, therefore, as corroborating the results obtained by Davenport (21), who showed, on the basis of yearly increments, that the "adolescent spurt" for boys is essentially a symmetrical phenomenon. This character of symmetry, together with the seasonal differential in the appearance of the accelerated phase of growth, necessarily implies that the *duration* of the accelerated phase must vary in different months. Such, indeed, appears to be roughly true. A careful inspection of the detailed statistics indicates that the "adolescent acceleration" is completed in four to five years in the fall and early winter months, and is not completed until five to six years in the spring and summer.

A summary picture of the cyclic character of the average growth in weight is shown in Figure 3, which was obtained by adding to the average weight at 6 years of age the successive monthly and summer increments through those of the fifteenth year.[5] The nature of the seasonal wave is clearly evident. The manner of forming this growth curve permits also a more exact analysis of certain differences between the sexes. It is shown in Figures 1 and 2 that the rates of growth for girls become distinctly greater than those for boys during the tenth

[5] The results of adding together the average number of days per short-time interval of growth are, in these data, to give so-called years of growth of slightly greater duration than 365 days. The variation introduced by this factor is not of material significance for the calculation of short-time growth *rates*, but is of considerable importance when the increments are cumulated to show accumulated growth. For this reason, corrections to years of exactly 365 days' duration have been made by arithmetic interpolation. The curve shown in Figure 3 represents, as far as the time interval is concerned, an actual average growth curve built up from the average increments for each month (and summer) for children from the sixth through the fifteenth year.

year. The mean weight of boys, however, remains greater than that of girls until the early part of the eleventh year. Furthermore, although the rates of growth for boys become greater than the rates for girls during the fall of the fourteenth year, the absolute weights of boys do not equal those of girls until the fifteenth year. This question of the times of decussation of the growth curves for the two

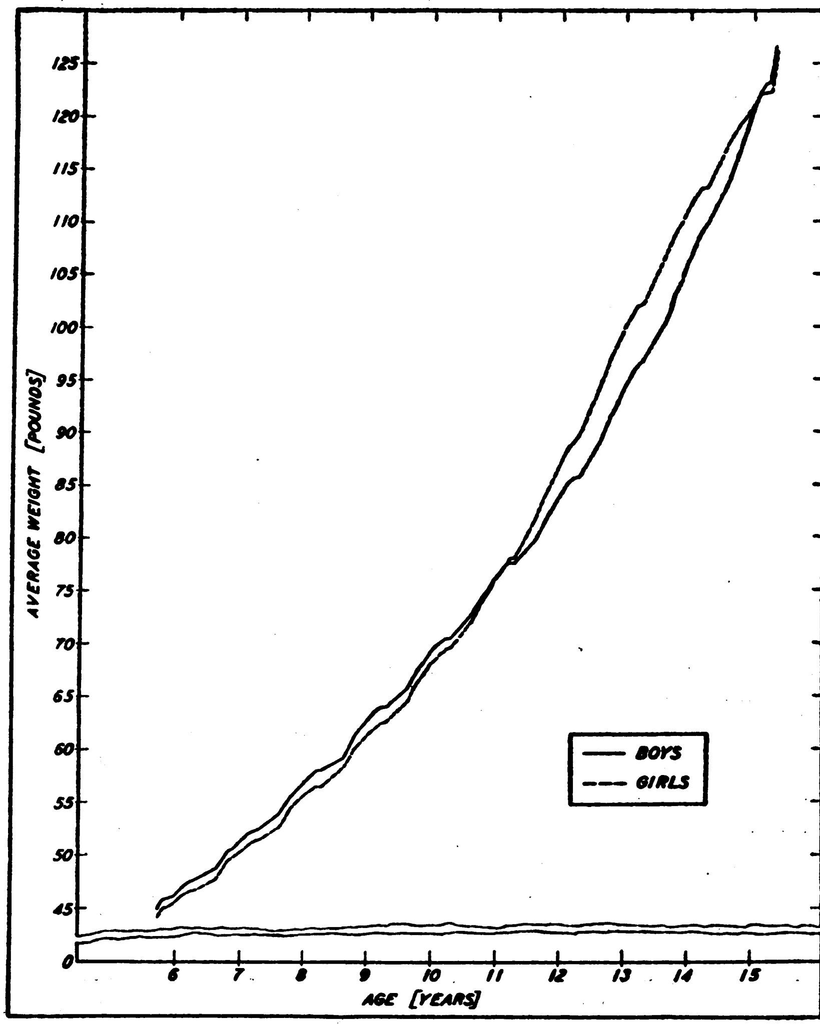

FIGURE 3.—Growth in average weight, based upon monthly and summer weight increments, of elementary school children, Hagerstown, Md.

sexes has been discussed by nearly every writer on the physical growth of children. The point will not be discussed further here, except to state that the data presented are in general agreement with the findings of most workers, and it may be considered as fairly well established that the points of decussation of average weight curves for the two sexes of native-born white children occur in the eleventh and fifteenth years.

The analysis of the data for the presentation of Figure 3 brings out another point of considerable interest. When the yearly gains in weight, found by adding the appropriate monthly and summer increments, are compared with the yearly gains, found by differencing the mean weights for successive years of age, it is observed that the former are larger, particularly for children from 12 to 16 years. This point is emphasized most strikingly by the fact that the average weight of the 16-year-old girls is 1.7 pounds less than the average weight of the 15-year-old girls, although the sum of the monthly increments for girls between these ages totals approximately 10 pounds.[6] This latter example is based upon very few cases, but it serves to illustrate the process of selective sampling which, without doubt, occurs in these data.

The general preferential factors which operate in the selection of such populations have been enumerated many times, but it seems worth while to consider, briefly, several of those which, it is reasonable to believe, are most effective in making ordinary elementary school populations in this country unrepresentative of the population in general. Of primary importance in this regard is the selection of the pupils who leave the group either to go to high school or to work. Frankel and Dublin (22) have shown, for New York City, that it is the heavier, taller, and more robust child that applies for an employment certificate. It has been shown, also, Porter (23), Boas and Wissler (24), and Schiotz (15), that the average heights and weights of children of the same age are very materially greater as those children are found in higher grades in school. Recently Richey (25) and Boas (26) have shown that on the average the larger and heavier child passes through the period of "adolescent acceleration" at an earlier age than the shorter, lighter child. Taken altogether, these facts indicate that the older children in the elementary school group not only weigh, on the average, slightly less than a random sample of children of the same age, but that they, due to the later appearance of the accelerated phase of growth, are probably growing more rapidly than children of the same age who have already left the elementary schools. The data presented in this paper show that the average weight found for 14-year-old boys is approximately 5 pounds greater, and the average weight found for 14-year-old girls is nearly 4 pounds greater when the average is based upon monthly growth rates rather than upon mean weights in the school population. The factors which have brought about these differences are

[6] The distributions of October weights for 16-year-old children contain only a few individuals, and it was not considered worth while to publish the constants of the frequency distributions for these groups.

influenced by selective elements so that average weights based upon accumulated monthly increments do not truly represent the weight characteristic of the population. Also, it is doubtless true that the weight-age tables used in this country, which are in almost every case taken from elementary school groups, are not applicable to the population at large.

In a recent paper, Emerson (27) has attacked the interpretation of seasonal variations in growth as reported by Malling-Hansen,

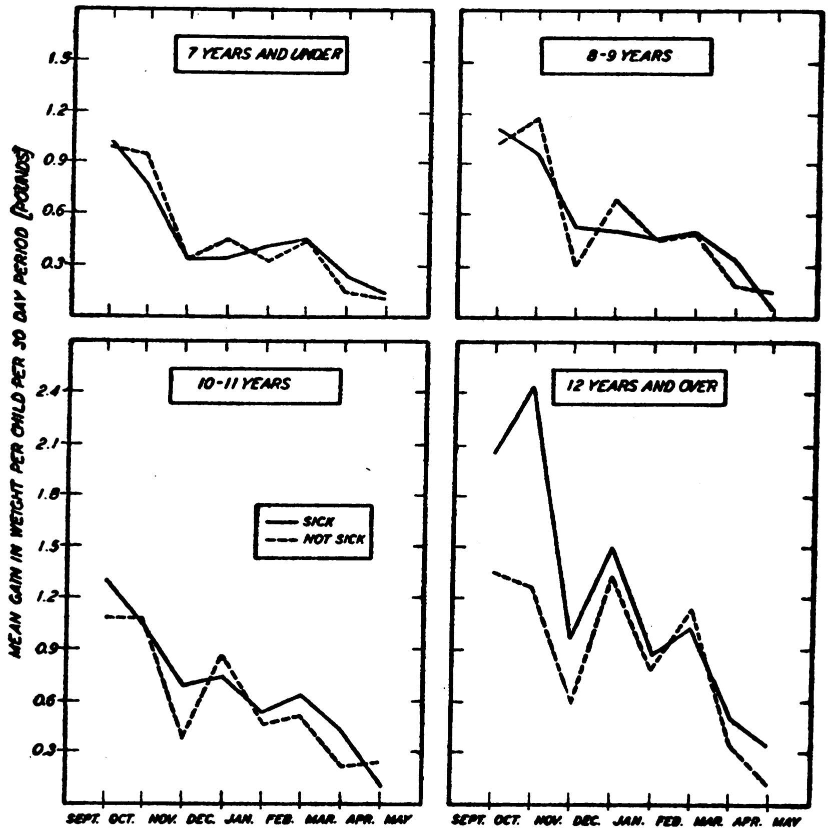

FIGURE 4.—Comparison of seasonal variation of average monthly growth rates for children not absent from school during an entire year because of sickness, with average monthly growth rates for children absent one or more days because of sickness.

Schmidt-Monnard, Porter, Bleyer, and others. That writer conceives that the seasonal cycle is not a "general biologic law." It is implied that lack of "hygienic living conditions," "acute infections," "fatigue," etc., are examples of nonbiologic phenomena. Emerson's report concludes with the statement:

> Growth of children living under favorable conditions can be found who, in the absence of infection or other sicknesses, exhibit a regular monthly gain in weight regardless of the season of the year.

It is implied in this quotation, and in other parts of the paper, that the seasonal variation as found by numerous careful workers is, in some manner, atypical of normal growth. It seems, therefore, justifiable to consider to what extent the evidence in this study is confirmatory.

It was stated that the material used in the present study may be considered as selected in that only the records of children present on 80 per cent of the weighing days for four years out of five were utilized. It seems reasonable to assume, therefore, that the results obtained are representative of a group of fairly healthy children. However, because records of absence from school were reported as part of the general health study, it is possible to carry this selection further. Figure 4, for which the data [7] were calculated as for Figure 1, was made in order to compare the growth rates for those children *who were not absent from school because of sickness at any time during a specified school year* with the growth rates of the remainder of the group. It is evident that this criterion for selecting a group of normal, healthy children is purely arbitrary, but it seems sufficient for present purposes. In each age class the number of children not sick is relatively small, the actual numbers ranging from 65 children in the 12-year and over class to 210 children in the 8 and 9 year old class. The variability of these samples is obviously great, and it is impossible to show a statistically significant difference between the sick group and the not-sick group. The absolute irregularity of the difference between the two groups accompanied by the systematic regularity with which the seasonal trends coincide presents, however, very strong evidence that the typical seasonal variation is not the result of including in the data records of seriously ill children who fail to gain or who lose weight.

The general problem is amplified in the data presented in Figure 5. Average monthly growth rates [8] for children of all ages of each sex are shown in this graph, together with the average sickness rates found by Collins (28) in the school children of Hagerstown for the school months from December, 1921, to May, 1925. The periods covered by these data are not strictly comparable, but for present purposes this is immaterial. It is evident that no clear relationship exists between the general incidence of sickness and seasonal growth in average weight.

The latter findings are, of course, in no way contradictory to the common knowledge that sickness can and does prevent normal growth. In no way, either, do they fail to substantiate the meticulous work of Malling-Hansen, which shows that the seasonal trend *can* be

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[7] For this comparison, records were grouped into approximately 2-year age classes, and the sexes were combined. The procedure was justified on the grounds that no large error will be made by such grouping, and that the effects of random sampling will be very much reduced.

[8] These rates are simply the unweighted arithmetic averages of the monthly rates presented in Table 2.

affected by sickness. The evidence is, however, reasonably conclusive that the observed seasonal variation of growth in weight can not be explained as the result of either individual or group illnesses.

SUMMARY AND CONCLUSIONS

Under the supervision of the medical officers of the United States Public Health Service, approximately 2,500 native-born white children

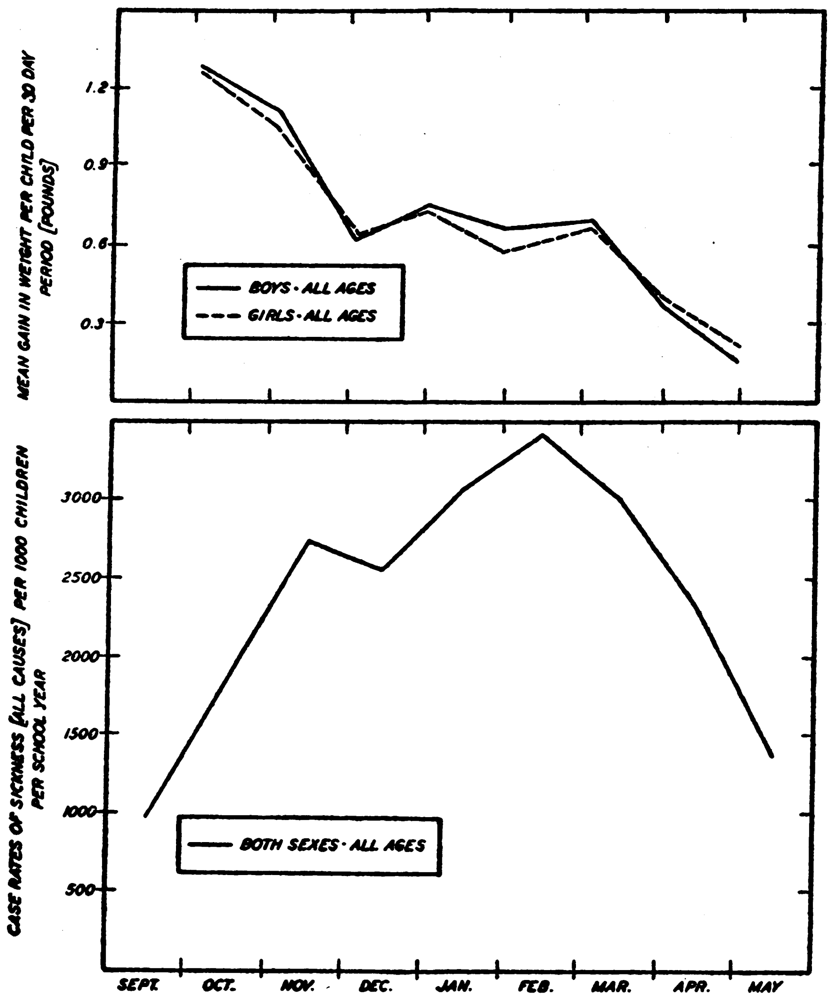

FIGURE 5.—Seasonal variation of average monthly growth rates and seasonal variation of sickness incidence rates, as observed in elementary school children, Hagerstown, Md.

attending the elementary schools of Hagerstown, Md., were weighed monthly during the school years from September, 1923, to May, 1928.

The basic data, specific for sex and single years of age, but unspecified with respect to the year of measurement, were analyzed by the calculation of the ordinary statistical constants (Mean, σ, β_1, and β_2) of the following frequency distributions:

(1) Actual weight on the October weighing day.

(2) Weight increments for the separate months of the school year from September to May.

(3) Weight increments for the summer vacation period, an interval of approximately three and one-half months.

The results of the analysis may be summarized under six headings:

(1) Maximum rates of average growth in weight are observed during the fall months, intermediate rates during the winter, and minimum rates during the spring. The average rate of growth during the summer period is approximately equal to the rates observed during February and March. The same cyclic changes are observed in both sexes and for each yearly age group from the sixth through the fourteenth year. These findings are in agreement, with few exceptions, with the previous work on the subject.

(2) During the sixth and seventh years, there is no consistent difference between the growth rates of boys and girls. During the eighth and ninth years, boys apparently grow at slightly greater rates than girls. In the spring of the tenth year, the rates for girls become greater than the rates for boys and remain higher for each subdivision of the year until the fall of the fourteenth year, when the rates for boys become greater and remain so through the fifteenth year.

(3) Analysis of the changes with age of growth rates for individual months shows:

- (*a*) Maximum growth rates for girls in the eleventh and twelfth years.
- (*b*) Maximum growth rates for boys in the fourteenth and fifteenth years.
- (*c*) No evidence which may be interpreted as representing a "pre-adolescent slump" or "lag" of average growth in weight.

(4) Suggestive evidence is brought out of a seasonal sex difference in the appearance of the "adolescent acceleration" of average weight growth. The "adolescent acceleration" in girls is apparently more pronounced in the spring and summer, and in boys is more pronounced in the fall and early winter.

(5) Comparison of the monthly growth rates of a selected group of children who were not absent from school during an entire year with the remainder of the group who were absent one or more days because of sickness shows that the typical seasonal variation in growth is not the result of including in the data records of seriously ill children who fail to gain or who lose weight.

(6) Comparison of the seasonal curve of monthly growth rates with the seasonal curve of incidence of sickness indicates that there is no concomitant variation between the two.

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COURT DECISION RELATING TO PUBLIC HEALTH

Bovine tuberculosis eradication law construed.—(Iowa Supreme Court; Peverill *v.* Dept. of Agriculture of Iowa et al. (Cheney et al., Interveners), 245 N. W. 334; decided Nov. 22, 1932.) Injunctions were sought to restrain the testing of cattle for tuberculosis. The lower court denied the injunctions and its decrees were affirmed by the supreme court. The points decided by the appellate court in its construction of the pertinent statutory provisions were, briefly stated, as follows:

Cattle could be tuberculin tested before being appraised.

The legislature did not intend to differentiate between an "examination" of a herd and the administration of the tuberculin test, but regarded the tuberculin test as a part of the examination.

Section 2666 of the code, which provided that "Said department shall proceed with the examination, including the tuberculin test, of all such cattle as rapidly as practicable", was not obsolete, as it was a part of the existing statutory law of the State and courts could not repeal legislative acts by declaring them obsolete.

Notice to cattle owners of the day and hour when testing would be performed was not required.

The veterinary designated to administer the tuberculin test could not be required to give a bond, as the legislature had not required a bond and the courts were without power to add to the law.

Where there was a substantial balance in the State bovine tuberculosis eradication fund, the contemplated work of testing cattle in a county would not be unlawful because of the fact that the eradication fund of that county was overdrawn.

DEATHS DURING WEEK ENDED FEBRUARY 11, 1933

[From the Weekly Health Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended Feb. 11, 1933	Corresponding week, 1932
Data from 85 large cities of the United States:		
Total deaths	8,422	8,313
Deaths per 1,000 population, annual basis	11.8	11.9
Deaths under 1 year of age	590	650
Deaths under 1 year of age per 1,000 estimated live births [1]	51	54
Deaths per 1,000 population, annual basis, first 6 weeks of year	12.7	12.0
Data from industrial insurance companies:		
Policies in force	69,070,242	74,068,315
Number of death claims	15,399	11,487
Death claims per 1,000 policies in force, annual rate	11.6	8.1
Death claims per 1,000 policies, first 6 weeks of year, annual rate	11.8	9.7

[1] 1933, 81 cities; 1932, 78 cities.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

CURRENT WEEKLY STATE REPORTS

These reports are preliminary, and the figures are subject to change when later returns are received by the State health officers

Reports for Weeks ended February 18, 1933, and February 20, 1932

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 18, 1933, and February 20, 1932

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932
New England States:								
Maine	1	6	56	40	3	589	1	0
New Hamphsire	1	2	8	------	1	9	0	0
Vermont	2	------	------	------	4	45	0	0
Massachusetts	22	63	19	18	265	427	0	2
Rhode Island	5	2	4	------	3	686	0	0
Connecticut	3	9	38	21	159	278	0	2
Middle Atlantic States:								
New York	67	132	[1] 41	[1] 158	1,993	1,969	4	10
New Jersey	22	49	91	56	818	161	2	1
Pennsylvanig	99	106	------	------	866	1,405	10	2
East North Central States:								
Ohio	59	33	208	22	455	267	2	0
Indiana	37	48	55	122	25	87	3	4
Illinois	46	120	72	164	270	228	14	12
Michigan	21	56	6	61	820	294	1	0
Wisconsin	3	18	227	301	286	274	0	1
West North Central States								
Minnesota	2	8	1	3	1,387	25	1	1
Iowa	16	9	------	4	3	7	2	1
Missouri	30	32	25	19	37	21	2	2
North Dakota	5	1	228	------	80	54	0	0
South Dakota	9	2	1	228	21	81	1	0
Nebraska	14	6	1	269	28	65	1	3
Kansas	6	21	13	17	331	70	0	11
South Atlantic States:								
Delaware	12	2	5	6	2	2	0	0
Maryland [2]	14	25	117	28	4	32	2	5
District of Columbia	10	20	3	2	5	3	0	0
Virginia	18	------	------	------	444	------	1	1
West Virginia	18	26	271	96	552	396	0	1
North Carolina	15	28	332	52	555	243	3	1
South Carolina	8	12	1,824	564	56	49	0	0
Georgia [3]	11	14	491	121	14	7	1	3
Florida	3	11	61	2	10	9	1	0

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 18, 1933, and February 20, 1932—Continued

Division and State	Diphtheria		Influenza		Measles		Meningococcus meningitis	
	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932
East South Central States:								
Kentucky	10	48	118	226	-------	103	1	3
Tennessee	15	35	168	169	52	64	3	5
Alabama	13	23	192	92	13	2	1	0
Mississippi	1	11	-------	-------	-------	-------	1	2
West South Central States:								
Arkansas	5	9	113	65	4	3	1	0
Louisiana	16	32	51	10	27	6	2	1
Oklahoma [4]	16	15	228	1,075	20	12	5	0
Texas [3]	54	42	252	148	679	44	1	2
Mountain States:								
Montana	-------	-------	93	1,708	154	102	0	2
Idaho	3	1	1	3	90	-------	0	1
Wyoming	-------	-------	2	-------	10	1	1	0
Colorado	6	10	68	-------	3	61	1	1
New Mexico	7	21	11	27	4	106	0	0
Arizona	2	6	12	68	-------	-------	1	0
Utah [3]	3	2	-------	-------	3	-------	1	0
Pacific States:								
Washington	3	1	1	-------	6	480	1	1
Oregon	1	8	94	257	111	104	0	0
California [3]	52	45	129	303	449	315	3	8
Total	791	1,170	5,731	6,525	11,122	9,186	75	89

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932
New England States:								
Maine	0	0	20	38	0	0	1	2
New Hampshire	0	0	44	28	0	0	0	0
Vermont	0	0	12	7	0	3	0	0
Massachusetts	1	1	390	543	0	0	3	4
Rhode Island	0	0	40	49	0	0	0	0
Connecticut	0	0	97	112	1	2	0	1
Middle Atlantic States:								
New York	1	5	738	1,421	0	2	5	10
New Jersey	0	0	314	279	0	0	1	2
Pennsylvania	0	1	856	613	0	0	10	13
East North Central States:								
Ohio	0	2	746	281	6	34	2	3
Indiana	2	0	133	101	1	17	1	1
Illinois	0	3	435	419	11	1	6	4
Michigan	1	2	528	489	0	3	6	13
Wisconsin	0	0	98	92	3	0	1	3
West North Central States:								
Minnesota	0	0	77	120	1	1	3	0
Iowa	0	1	31	44	25	24	0	1
Missouri	0	0	50	83	1	12	2	1
North Dakota	0	0	11	45	0	3	0	1
South Dakota	0	0	21	3	2	9	2	1
Nebraska	0	0	24	21	1	8	0	0
Kansas	0	0	78	50	2	5	1	0
South Atlantic States:								
Delaware	0	0	5	12	0	0	0	1
Maryland [3]	0	0	81	113	0	0	1	4
District of Columbia	0	0	11	27	0	0	0	0
Virginia	0	1	36	-------	0	-------	3	-------
West Virginia	0	0	25	51	0	0	7	3
North Carolina	0	2	29	29	0	5	3	3
South Carolina	0	0	2	6	0	0	3	3
Georgia [3]	0	0	9	14	0	0	9	4
Florida	0	1	7	14	0	0	6	13

See footnotes at end of table.

Cases of certain communicable diseases reported by telegraph by State health officers for weeks ended February 18, 1933, and February 20, 1932—Continued

Division and State	Poliomyelitis		Scarlet fever		Smallpox		Typhoid fever	
	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932	Week ended Feb. 18, 1933	Week ended Feb. 20, 1932
East South Central States:								
Kentucky	2	2	30	56	0	7	6	13
Tennessee	1	1	30	50	1	8	4	11
Alabama	0	1	21	16	3	5	0	5
Mississippi	0	0	8	14	4	37	2	7
West South Central States:								
Arkansas	0	0	4	10	3	37	3	0
Louisiana	0	1	2	19	2	3	6	28
Oklahoma [4]	1	0	24	10	4	1	1	1
Texas [3]	0	0	55	44	8	26	14	4
Mountain States:								
Montana	0	0	31	54	2	2	0	1
Idaho	0	0	3	2	5	4	0	1
Wyoming	0	1	11	3	0	0	0	0
Colorado	0	1	25	40	0	2	1	1
New Mexico	0	0	12	8	0	1	0	1
Arizona	0	0	14	11	0	0	3	0
Utah [2]	0	0	9	5	0	0	0	0
Pacific States:								
Washington	0	0	39	37	5	15	3	0
Oregon	0	0	30	25	6	16	1	1
California [3]	1	3	208	132	33	17	4	5
	10	29	5,504	5,640	130	310	124	170

[1] New York City only.
[2] Week ended Friday.
[3] Typhus fever, week ended Feb. 18, 1933, 6 cases; 3 cases in Georgia, 2 cases in Texas, and 1 case in California.
[4] Figures for 1933 are exclusive of Oklahoma City and Tulsa and for 1932 are exclusive of Tulsa only.

SUMMARY OF MONTHLY REPORTS FROM STATES

The following summary of cases reported monthly by States is published weekly and covers only those States from which reports are received during the current week.

State	Meningococcus meningitis	Diphtheria	Influenza	Malaria	Measles	Pellagra	Poliomyelitis	Scarlet fever	Smallpox	Typhoid fever
January, 1933										
Alabama	10	86	4,657	34	11	17	5	89	4	12
Florida		45	445	27	12	1	0	36	0	12
Maryland	13	53	4,378		24		1	403	0	9
Massachusetts	9	136	866	2	601		1	1,661	0	13
Minnesota	8	45	248		1,760		1	380	6	4
New Jersey	7	123	1,506		1,669		2	1,240	0	7
New York	24	287			5,260		5	3,217	0	35
Ohio	11	236	1,331		2,565		3	2,440	37	24
Tennessee	15	71	5,437	21	22	8	2	187	2	26

January, 1933

	Cases
Actinomycosis:	
Minnesota	1
Chicken pox:	
Alabama	97
Florida	81
Maryland	667
Massachusetts	1,715
Minnesota	562
New Jersey	2,023
New York	3,728
Ohio	2,623
Tennessee	326
Diarrhea:	
Maryland	8
Diarrhea and enteritis:	
Ohio	7
Dysentery:	
Maryland	3
Massachusetts	1
Minnesota	2
Minnesota (amebic)	1
New York	7
Tennessee	1
Food poisoning:	
Ohio	17
German measles:	
Maryland	7
Massachusetts	27
New Jersey	39
New York	101
Ohio	19
Tennessee	17
Impetigo contagiosa:	
Maryland	21
Tennessee	8
Lead poisoning:	
Massachusetts	1
New Jersey	1
Ohio	6

Lethargic encephalitis:	Cases
Alabama	2
Massachusetts	1
Minnesota	1
New Jersey	2
New York	8
Ohio	4
Tennessee	3
Mumps:	
Alabama	138
Florida	1
Maryland	342
Massachusetts	750
New Jersey	1,070
Ohio	917
Tennessee	100
Ophthalmia neonatorum:	
Maryland	6
Massachusetts	110
New Jersey	4
New York	3
Ohio	88
Tennessee	6
Paratyphoid fever:	
New York	1
Tennessee	1
Puerperal septicemia:	
Ohio	10
Tennessee	1

Rabies in animals:	Cases
Maryland	2
New Jersey	17
New York [1]	1
Tennessee	23
Scabies:	
Maryland	1
Tennessee	24
Septic sore throat:	
Maryland	15
Massachusetts	11
New York	24
Ohio	329
Tennessee	15
Tetanus:	
Maryland	1
Massachusetts	2
New York	3
Ohio	1
Tennessee	2
Trachoma:	
Massachusetts	5
New Jersey	1
Ohio	6
Tennessee	33
Trichinosis:	
New York	10
Tularæmia:	
Alabama	1
Maryland	3

Tularæmia—Continued.	Cases
New Jersey	1
Ohio	7
Tennessee	2
Typhus fever:	
Alabama	10
Florida	2
Maryland	1
New York	1
Undulant fever:	
Maryland	1
Minnesota	7
New Jersey	3
New York	21
Ohio	5
Vincent's angina:	
Maryland	7
New York [1]	102
Tennessee	5
Whooping cough:	
Alabama	131
Florida	24
Maryland	108
Massachusetts	739
Minnesota	324
New Jersey	373
New York	1,838
Ohio	409
Tennessee	93

WEEKLY REPORTS FROM CITIES

City reports for week ended February 11, 1933

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Maine:											
Portland	2	19	2	0	2	3	0	1	0	6	31
New Hampshire:											
Concord	0	------	0	0	1	1	0	0	0	0	12
Manchester	0	------	6	0	6	3	0	1	0	0	24
Vermont:											
Barre	0	------	0	0	0	0	0	1	0	0	5
Burlington	0	------	0	0	0	0	0	0	0	0	5
Massachusetts:											
Boston	7	3	4	18	36	94	0	13	0	46	229
Fall River	1	4	4	0	2	4	0	2	0	12	30
Springfield	0	------	0	3	1	6	0	1	0	20	41
Worcester	0	------	0	3	6	13	0	2	0	4	------
Rhode Island:											
Pawtucket	0	------	0	0	0	0	0	0	0	0	14
Providence	2	4	4	0	10	17	0	3	0	3	81
Connecticut:											
Bridgeport	1	2	0	12	3	9	0	1	0	1	37
Hartford	0	1	0	2	9	7	0	3	0	0	63
New Haven	0	------	2	0	8	3	0	0	0	6	40
New York:											
Buffalo	10	3	1	5	23	39	0	13	0	34	137
New York	50	56	28	890	172	277	0	90	5	93	1,529
Rochester	0	------	1	1	6	21	0	2	1	7	77
Syracuse	0	------	0	1	5	26	0	1	0	2	69
New Jersey:											
Camden	2	4	3	0	6	10	0	0	1	1	42
Newark	2	17	1	229	14	35	0	5	0	14	118
Trenton	0	6	2	0	4	22	0	5	0	6	41
Pennsylvania:											
Philadelphia	5	31	7	51	39	159	0	31	1	3	464
Pittsburgh	4	11	6	4	20	32	0	7	0	14	165
Reading	0	------	0	55	2	5	0	0	0	0	33
Scranton	3	------	------	0	------	14	0	------	0	1	------
Ohio:											
Cincinnati	2	4	3	2	9	11	0	1	0	1	123
Cleveland	6	81	2	3	12	142	0	15	0	23	218
Columbus	0	1	1	114	0	7	0	4	0	8	85
Toledo	1	2	1	63	6	54	0	4	0	1	68
Indiana:											
Fort Wayne	6	------	1	0	1	1	0	0	0	0	25
Indianapolis	3	------	2	4	16	22	0	6	0	1	------
South Bend	0	------	0	0	1	2	0	0	0	6	16
Terre Haute	1	------	0	0	1	8	0	1	0	0	23

[1] Exclusive of New York City.

City reports for week ended February 11, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Illinois:											
Chicago	9	9	8	143	46	215	0	39	1	7	650
Springfield	2	3	0	1	1	3	0	1	0	0	21
Michigan:											
Detroit	9	6	6	226	19	141	0	20	1	74	262
Flint	1	25	1	6	2	1	0	1	0	0	35
Grand Rapids	0	------	2	1	3	10	0	0	0	41	35
Wisconsin:											
Kenosha	0	------	0	0	0	0	2	0	0	7	6
Madison	0	------	------	31	------	0	0	------	0	0	------
Milwaukee	1	1	1	2	9	25	0	3	0	23	101
Racine	0	------	0	1	1	11	0	0	0	6	10
Superior	0	------	0	0	0	0	0	0	0	0	6
Minnesota:											
Duluth	0	------	1	2	0	2	0	1	0	8	18
Minneapolis	1	------	1	503	6	32	0	1	0	9	94
St. Paul	0	3	3	49	7	11	0	4	0	18	66
Iowa:											
Des Moines	8	------	------	0	------	1	0	------	0	0	23
Sioux City	4	------	------	0	------	2	0	------	0	3	------
Waterloo	1	------	------	0	------	0	0	------	0	0	------
Missouri:											
Kansas City	0	------	7	132	33	38	0	4	0	5	137
St. Joseph	3	------	1	6	3	2	0	0	0	1	26
St. Louis	17	4	0	5	12	23	0	13	0	3	189
North Dakota:											
Fargo	0	------	0	0	0	0	0	0	0	0	3
Grand Forks	0	------	0	3	0	0	0	0	0	0	------
South Dakota:											
Aberdeen	0	------	0	1	0	1	0	0	0	0	------
Nebraska:											
Omaha	5	------	0	4	7	9	0	3	0	0	57
Kansas:											
Topeka	0	------	2	27	1	4	0	0	0	0	25
Wichita	0	150	5	2	4	1	0	1	0	1	54
Delaware:											
Wilmington	0	------	0	2	3	3	0	2	0	0	32
Maryland:											
Baltimore	2	33	4	0	35	62	0	14	1	26	243
Cumberland	0	------	0	0	1	2	0	0	0	0	11
Frederick	0	------	0	0	0	1	0	0	0	0	5
District of Col.:											
Washington	6	5	5	1	13	11	0	15	0	4	181
Virginia:											
Lynchburg	1	------	0	2	0	2	0	1	0	0	4
Norfolk	2	------	0	1	2	1	0	0	0	1	22
Richmond	1	------	0	0	0	12	0	3	1	0	47
Roanoke	0	------	1	65	0	2	0	1	0	0	17
West Virginia:											
Charleston	0	1	0	0	1	0	0	1	0	0	10
Huntington	1	------	------	8	------	1	0	------	0	0	------
Wheeling	0	------	1	111	0	5	0	1	0	2	21
North Carolina:											
Raleigh	0	------	2	1	0	0	0	0	0	2	9
Wilmington	0	------	0	18	2	3	0	0	0	2	8
Winston-Salem	3	------	0	0	1	1	0	1	0	0	11
South Carolina:											
Charleston	1	114	1	0	2	0	0	6	0	0	22
Columbia	------	------	------	------	------	------	------	------	------	------	------
Greenville	0	------	0	8	0	0	0	0	0	0	------
Georgia:											
Atlanta	1	32	4	0	5	4	0	7	0	21	73
Brunswick	0	2	1	0	0	0	0	0	0	0	4
Savannah	1	111	2	0	1	0	0	2	0	0	32
Florida:											
Miami	3	44	4	1	3	0	0	3	0	2	37
Tampa	1	15	1	0	3	0	0	2	0	1	31
Kentucky:											
Ashland	0	------	0	10	0	0	0	0	1	0	------
Lexington	0	7	0	2	3	0	0	2	0	0	17
Louisville	2	1	0	0	14	10	0	2	1	0	85
Tennessee:											
Memphis	0	------	2	1	3	4	0	7	3	4	67
Nashville	0	------	4	2	2	3	0	2	0	2	43
Alabama:											
Birmingham	2	8	1	0	4	5	0	5	0	4	64
Mobile	------	------	------	------	------	------	------	------	------	------	------
Montgomery	0	------	------	0	------	0	0	------	0	0	------

City reports for week ended February 11, 1933—Continued

State and city	Diphtheria cases	Influenza		Measles cases	Pneumonia deaths	Scarlet fever cases	Smallpox cases	Tuberculosis deaths	Typhoid fever cases	Whooping cough cases	Deaths, all causes
		Cases	Deaths								
Arkansas:											
Fort Smith	0			0		0	0		0	0	
Little Rock	0		0	0	7	0	0	0	0	0	7
Louisiana:											
New Orleans	9	9	11	1	5	7	1	8	2	7	145
Shreveport	1		0	1	3	0	0	1	0	0	20
Oklahoma:											
Tulsa	0			1		1	0		0	2	1
Texas:											
Dallas	9	3	3		12	5	1	2	0	0	73
Fort Worth	2		2	35	3	3	2	1	5	0	26
Galveston	2		0	4	2	5	0	1	0	0	11
Houston	5		0	67	6	2	2	4	2	0	53
San Antonio											
Montana:											
Billings	0		0	0	0	0	0	0	0	4	8
Great Falls	0		0	16	2	3	0	0	0	0	8
Helena	0		0	0	0	0	0	0	0	0	5
Missoula	0		0	2	0	1	0	0	0	0	0
Idaho:											
Boise	0		0	8	0	1	0	1	0	0	4
Colorado:											
Denver	3	73	7	2	8	7	0	4	0	1	88
Pueblo	0		1	0	5	0	0	0	1	4	16
New Mexico:											
Albuquerque	4	1	0	1	1	2	0	2	0	1	10
Arizona:											
Phoenix	1		0	0	0	3	0	0	0	0	
Utah:											
Salt Lake City	0		0	0	5	7	0		0	1	61
Nevada:											
Reno	0		0	0	0	0	0	0	0	0	4
Washington:											
Seattle	0			0		8	0		0	2	
Spokane	0			1		0	1		0	0	
Tacoma	0		0	0	3	2	0	0	0	0	34
Oregon:											
Portland	1	5	0	5	3	9	2	3	0	0	65
Salem	0	6	0	104	0	0	0	0	0	0	
California:											
Los Angeles	36	66	4	158	18	66	33	25	0	26	329
Sacramento	2	1	1	3	11	2	0	2	1	8	44
San Francisco	4	31	4	3	14	5	0	9	0	55	190

State and city	Meningococcus meningitis		Poliomyelitis cases
	Cases	Deaths	
Connecticut:			
Bridgeport	1	1	0
New York:			
New York	5	0	1
New Jersey:			
Newark	0	1	0
Pennsylvania:			
Philadelphia	1	1	0
Ohio:			
Toledo	1	1	0
Indiana:			
Indianapolis	1	1	0
South Bend	1	0	0
Illinois:			
Chicago	15	6	1
Michigan:			
Detroit	1	0	0
Missouri:			
Kansas City	1	0	0
St. Joseph	2	2	0
St. Louis	1	2	0
Maryland:			
Baltimore	0	1	0
District of Columbia:			
Washington	3	1	0
Tennessee:			
Memphis	0	0	1
Louisiana:			
New Orleans	2	1	1
Oklahoma:			
Tulsa	1	1	0
Arizona:			
Phoenix	0	1	0
Oregon:			
Portland	0	1	1

Lethargic encephalitis.—Cases: Springfield, Mass., 1; Birmingham, 1.
Pellagra.—Cases: Charleston, S. C., 1; Atlanta, 2; Savannah, 1.; Birmingham, 2; New Orleans, 2.
Typhus fever.—Cases: Savannah, 2.

FOREIGN AND INSULAR

CANADA

Provinces—Communicable diseases—Week ended February 4, 1933.—The Department of Pensions and National Health of Canada reports cases of certain communicable diseases for the week ended February 4, 1933, as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Cerebrospinal meningitis				1	2		1		2	6
Chicken pox		1		169	239	76	33	12	36	566
Diphtheria		4	4	22	11	7	1	3	4	56
Erysipelas		2		8		2	5	1	1	19
Influenza	10	34		12	519	14	3		27	619
Lethargic encephalitis					1					1
Measles		41	4	104	367		2	21	154	693
Mumps					171	20	1		11	203
Pneumonia		6			43		20		2	71
Poliomyelitis				1						1
Scarlet fever		1	3	99	73	12	27	5	8	228
Smallpox							2			2
Trachoma					5		2		2	9
Tuberculosis	1		17	96	39	22	18	1	14	208
Typhoid fever			1	24	4	11	2		2	44
Undulant fever					2					2
Whooping cough				139	108	25	58	3	25	358

GREAT BRITAIN

Influenza.—Deaths from influenza were registered in the 118 great towns of England and Wales and the 16 principal towns of Scotland during the three weeks ended February 4, 1933, as follows:

Week ended—	118 great towns, England and Wales	16 principal towns, Scotland
Jan. 21, 1933	1,569	108
Jan. 28, 1933	1,934	84
Feb. 4, 1933	1,911	98

The following table shows the general death rates per 1,000 population in towns of Great Britain during the three weeks ended February 4, 1933. This table is a continuation of the table which appears on page 161 of the Public Health Reports of February 10, 1933.

Deaths (all causes) per 1,000 population, annual basis

	Week ended—		
	Jan. 21, 1933	Jan. 28, 1933	Feb. 4, 1933
118 great towns of England and Wales	22.2	25.2	26.8
Greater London	20.9	22.6	24.4
Great towns in—			
Southeastern area	21.7	23.1	25.6
Northern area	24.4	28.6	28.8
Midland area	20.9	23.1	23.4
Eastern area	15.7	26.5	29.1
Southwestern area	20.3	19.6	28.2
Wales and Monmouthshire	16.5	26.7	33.6
Liverpool	24.6	25.7	28.2
Bristol	27.4	29.7	32.6
16 principal towns of Scotland	20.4	20.9	23.1
Glasgow	18.0	17.9	22.2

PUERTO RICO

Communicable diseases—Four weeks ended January 28, 1933.—During the four weeks ended January 28, 1933, cases of certain communicable diseases were reported in Puerto Rico, as follows:

Disease	Cases	Disease	Cases
Chicken pox	20	Ophthalmia neonatorum	6
Diphtheria	45	Paratyphoid fever	8
Dysentery	743	Pellagra	2
Erysipelas	3	Puerperal fever	6
Filariasis	3	Syphilis	130
Framboesia, tropical	2	Tetanus	4
Impetigo contagiosa	6	Tetanus, infantile	2
Influenza	270	Trachoma	2
Leprosy	3	Tuberculosis	329
Malaria	3, 661	Typhoid fever	20
Measles	142	Whooping cough	69
Mumps	15		

VIRGIN ISLANDS

Notifiable diseases—November, 1932–January, 1933.—During the months of November and December, 1932, and January, 1933, cases of certain notifiable diseases were reported in the Virgin Islands as follows:

Disease	Cases			Disease	Cases		
	November, 1932	December, 1932	January, 1933		November, 1932	December, 1932	January, 1933
Chicken pox			2	Pellagra	1		
Dysentery		1		Sprue		1	
Filariasis	17	6	14	Syphilis	15	18	13
Gonorrhea	4		6	Tetanus			1
Leprosy	1			Tuberculosis	1	2	3
Malaria	61	253	193	Uncinariasis	1	1	1
Measles			1	Whooping cough	1	12	24

CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER

(NOTE.—A table giving current information of the world prevalence of quarantinable diseases appeared in the PUBLIC HEALTH REPORTS for February 24, 1933, pp. 200–210. A similar cumulative table will appear in the PUBLIC HEALTH REPORTS to be issued March 24, 1933, and thereafter, at least for the time being, in the issue published on the last Friday of each month.)

Cholera

Philippine Islands:—For the week ended February 18, 1933, 7 cases of cholera with 3 deaths were reported in Cebu Province, Philippine Islands, and 7 cases with 6 deaths in Leyte Province.

Plague

Hawaii Territory.—A rat taken January 25, 1933, in Makawao District, Island of Maui, has been proved positive for plague. A case of plague was reported February 1, 1933, in Hamakua district, Island of Hawaii, and a plague-infected rat was found in Hamakua district January 31, 1933. Makawao district is about 100 miles from Honolulu and Hamakua district is about 175 miles.

Smallpox

Egypt—Alexandria.—For the week ended February 11, 1933, 301 cases of smallpox with 52 deaths were reported at Alexandria, Egypt.

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