THE DISTRIBUTION OF THE ABO BLOOD GROUPS IN JAPAN¹

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Summary Data on ABO blood groups of 4,464,349 Japanese individuals were collected from prefectural health departments, health centers, and Red Cross blood centers in the whole country. Phenotypic and gene frequencies for each subpopulation were calculated and tabulated.

Phenotypic frequencies in the whole sample are 29.25% O, 38.65% A, 22.15% B and 9.95% AB. Gene frequencies are estimated to be $p(I^A)=0.2833$, $q(I^B)=0.1759$, and $r(I^O)=0.5407$.

Significant gradients of the gene frequencies were apparent, *i.e.* the I^A gene is increased and I^B and I^O genes are decreased from the northeast to the southwest.

There are a slight, but significant, decrease in group O and increases in other groups in recent years. Possible causes of these changes were discussed.

INTRODUCTION

Country-wide distribution of ABO blood groups in Japan was studied first by Furuhashi (1933) on more than four hundreds thousands individuals. In 1940, Kobayashi cited ABO data on 530 thousands Japanese individuals from 261 references published during the period from 1922 to 1939 and tabulated frequencies of the phenotypes and alleles in all of 47 prefectures. Similar studies were carried out by Tanaka (1959), Nei and Imaizumi (1966), and Akaishi and Kudo (1975), compiling so far accessible data. These studies except Furuhashi's one (1933) were based upon numerous sources obtained during periods as long as 18 to 50 years or more.

Recently extensive data on ABO blood groups became available at health centers, Red Cross blood centers, and prefectural health departments in the whole country. These data were collected, analyzed and presented in this communication.

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MATERIALS AND METHODS

In September 1973, a letter was sent addressed to the health department of each prefecture except Okinawa, requesting data on ABO and Rh blood groups accumulated at the health centers under the health department. Health departments of 12 prefectures responded to the request. Subsequently, a similar letter was sent to each health center of all other prefectures. Thus, ABO data for more than 500 health centers, in total, were obtained. In several prefectures, such data were available at Red Cross blood centers to which the blood typing was entirely or partly entrusted.

In Kagoshima Prefecture, data on 376,515 high school students in the main island of Kyushu obtained through Prof. Tetuo Zyo and data on 12,336 individuals obtained from 3 health centers in isolated islands were used for the present analyses.

All the materials were blood-typed during the period from April 1964 to March 1975 inclusive, mostly from April 1970 to March 1973.

Most data were classified by the health centers where the blood typing was carried out. In Metropolis Tokyo, data from two or more health centers located in each of ku-districts were combined. Data from Nara Prefecture had been classified by residences of the testees.

Data from all the Red Cross blood centers and those from some prefectural health departments gave only the total of the prefecture. In Fukushima Prefecture, all blood typing were carried out at the Red Cross blood centers, and thus, distribution of blood groups at various districts in the prefecture was unknown.

Thus, ABO data on 4,464,349 individuals were divided into 46 prefectures, and data on 3,292,766 individuals of the total were divided into 523 subpopulations by health center or district.

In Figs. 6-14 in Appendix, health centers are shown by open circles or $\times$ according to whether the ABO data were available or not at there, and centers of ku-districts in Tokyo or local centers of regions in Nara and Kagoshima Prefectures are shown by open squares.

Frequencies of phenotypes and alleles of ABO blood groups, and χ^2 values for the deviation from expectation of the random distribution were calculated for (1) data of each health center or district, (2) total of data from all health centers or districts in each prefecture, (3) data from each prefectural department, (4) data from Red Cross blood centers in each prefecture, and (5) grand total of data in each prefecture.

The frequencies of ABO alleles were estimated using following formulas;

$$\text{Frequency of } I^A \quad p = 1 - \sqrt{(n_O + n_B)/N}(1 + D/2),$$

$$\text{Frequency of } I^B \quad q = 1 - \sqrt{n_O + n_A/N}(1 + D/2),$$

$$\text{Frequency of } I^O \quad r = (\sqrt{n_O/N} + D/2)(1 + D/2),$$

where n_O , n_A , n_B and N are, respectively, numbers of O, A, B, and all groups in the

sample, and

$$D = 1 - \sqrt{(n_O + n_A)/N} - \sqrt{(n_O + n_B)/N} - \sqrt{n_O/N}.$$

χ^2 value was calculated from $2N(1 + r/pq)D^2$ with one degree of freedom.

These values for Data (5), *i.e.* grand total of each prefecture are summarized in Table 1 and Fig. 2 (an equilateral triangle), and Data (1) to (4) are listed in Appendix.

RESULTS

Phenotypic frequencies of ABO blood groups in the whole country are 29.25%

Fig. 1. Prefectures in Japan. The numbers correspond to those in Table 1.

Table 1. Distribution of ABO blood groups in Japan for prefectures.

Prefecture	N	O		A		B		AB		p	q	r
		No.	(%)	No.	(%)	No.	(%)	No.	(%)			
1. Hokkaido (北海道)	283,471	85,411	(30.13)	105,520	(37.22)	65,259	(23.02)	27,281	(9.62)	.2711	.1794	.5496
2. Aomori (青森)	31,203	10,461	(33.53)	10,142	(32.50)	7,824	(25.07)	2,776	(8.90)	.2344	.1873	.5783
3. Iwate (岩手)	55,491	18,332	(33.04)	19,484	(35.11)	12,916	(23.28)	4,759	(8.58)	.2497	.1746	.5757
4. Miyagi (宮城)	243,298	75,178	(30.90)	88,969	(36.57)	55,659	(22.88)	23,492	(9.66)	.2665	.1785	.5550
5. Akita (秋田)	137,872	43,222	(31.35)	47,663	(34.57)	34,560	(25.07)	12,427	(9.01)	.2493	.1884	.5623
6. Yamagata (山形)	46,465	14,259	(30.69)	17,031	(36.65)	10,731	(23.09)	4,444	(9.56)	.2666	.1794	.5540
7. Fukushima (福島)	46,804	14,619	(31.23)	17,644	(37.70)	10,261	(21.92)	4,280	(9.14)	.2710	.1698	.5592
8. Ibaraki (茨城)	66,428	19,938	(30.01)	24,914	(37.51)	15,125	(22.77)	6,451	(9.71)	.2735	.1783	.5481
9. Tochigi (栃木)	20,329	5,989	(29.46)	7,622	(37.49)	4,928	(24.24)	1,790	(8.81)	.2683	.1825	.5492
10. Gunma (群馬)	277,751	83,798	(30.17)	103,685	(37.33)	62,204	(22.40)	28,064	(10.10)	.2746	.1782	.5472
11. Saitama (埼玉)	52,989	15,240	(28.76)	20,281	(38.27)	12,135	(22.90)	5,333	(10.06)	.2814	.1814	.5372
12. Chiba (千葉)	13,818	4,026	(29.14)	5,095	(36.87)	3,317	(24.00)	1,380	(9.99)	.2712	.1877	.5411
13. Tokyo (東京)	293,688	85,587	(29.14)	112,400	(38.27)	65,849	(22.42)	29,852	(10.16)	.2818	.1788	.5393
14. Kanagawa (神奈川)	33,460	9,712	(29.03)	12,892	(38.53)	7,537	(22.53)	3,319	(9.92)	.2822	.1782	.5396
15. Niigata (新潟)	85,917	24,158	(28.12)	33,385	(38.86)	19,540	(22.74)	8,834	(10.28)	.2870	.1817	.5312
16. Toyama (富山)	6,961	1,987	(28.54)	2,797	(40.18)	1,545	(22.20)	632	(9.08)	.2887	.1716	.5397
17. Ishikawa (石川)	14,887	4,606	(30.94)	5,361	(36.01)	3,576	(24.02)	1,344	(9.03)	.2591	.1821	.5588
18. Fukui (福井)	194,895	58,334	(29.93)	74,503	(38.23)	44,252	(22.71)	17,806	(9.14)	.2750	.1748	.5502
19. Yamanashi (山梨)	15,671	4,484	(28.61)	5,877	(37.50)	3,664	(23.38)	1,646	(10.50)	.2788	.1868	.5344
20. Nagano (長野)	348,937	103,726	(29.73)	129,533	(37.12)	80,737	(23.14)	34,941	(10.01)	.2728	.1823	.5448
21. Gifu (岐阜)	34,255	8,959	(26.15)	14,172	(41.37)	7,086	(20.69)	4,038	(11.79)	.3148	.1778	.5074
22. Shizuoka (静岡)	11,933	3,421	(28.67)	4,383	(36.73)	2,877	(24.11)	1,252	(10.49)	.2735	.1913	.5352
23. Aichi (愛知)	148,146	42,521	(28.70)	57,408	(38.75)	32,849	(22.17)	15,368	(10.37)	.2866	.1786	.5348
24. Mie (三重)	8,370	2,487	(29.71)	3,270	(39.07)	1,830	(21.86)	783	(9.35)	.2822	.1709	.5470
25. Shiga (滋賀)	2,466	702	(28.47)	974	(39.50)	564	(22.87)	226	(9.16)	.2845	.1762	.5392
26. Kyoto (京都)	12,674	3,637	(28.70)	5,011	(39.54)	2,705	(21.34)	1,321	(10.42)	.2923	.1738	.5340
27. Osaka (大阪)	605,105	174,124	(28.78)	238,547	(39.42)	131,965	(21.81)	60,469	(9.99)	.2889	.1742	.5369

continued

Prefecture	N	O		A		B		AB		p	q	r
		No.	(%)	No.	(%)	No.	(%)	No.	(%)			
28. Hyogo (兵庫)	375, 877	108, 155	(28. 77)	149, 320	(39. 73)	80, 981	(21. 54)	37, 421	(9. 96)	. 2907	. 1724	. 5369
29. Nara (奈良)	16, 024	4, 761	(29. 71)	6, 098	(38. 06)	3, 590	(22. 40)	1, 575	(9. 83)	. 2781	. 1768	. 5451
30. Wakayama (和歌山)	26, 616	7, 978	(29. 97)	10, 135	(38. 08)	6, 022	(22. 63)	2, 481	(9. 32)	. 2751	. 1753	. 5496
31. Tottori (鳥取)	99, 371	28, 589	(28. 77)	40, 358	(40. 61)	20, 151	(20. 28)	10, 273	(10. 34)	. 2992	. 1668	. 5340
32. Shimane (島根)	4, 184	1, 256	(30. 02)	1, 609	(38. 46)	907	(21. 68)	412	(9. 85)	. 2808	. 1724	. 5468
33. Okayama (岡山)	16, 227	4, 117	(25. 37)	6, 691	(41. 23)	3, 655	(22. 52)	1, 764	(10. 87)	. 3086	. 1843	. 5071
34. Hiroshima (広島)	12, 929	3, 577	(27. 67)	5, 239	(40. 52)	2, 789	(21. 57)	1, 324	(10. 24)	. 2985	. 1744	. 5271
35. Yamaguchi (山口)	11, 505	3, 158	(27. 45)	4, 696	(40. 82)	2, 449	(21. 29)	1, 202	(10. 45)	. 3020	. 1738	. 5242
36. Tokushima (徳島)	17, 605	4, 821	(27. 38)	7, 240	(41. 12)	3, 694	(20. 98)	1, 850	(10. 51)	. 3045	. 1723	. 5232
37. Kagawa (香川)	29, 158	8, 020	(27. 51)	12, 012	(41. 20)	6, 009	(20. 61)	3, 117	(10. 69)	. 3061	. 1710	. 5230
38. Ehime (愛媛)	54, 856	13, 996	(25. 51)	23, 585	(42. 99)	11, 239	(20. 49)	6, 036	(11. 00)	. 3219	. 1724	. 5057
39. Kochi (高知)	78, 819	21, 424	(27. 18)	32, 286	(40. 96)	16, 459	(20. 88)	8, 650	(10. 97)	. 3063	. 1743	. 5194
40. Fukuoka (福岡)	36, 425	10, 346	(28. 40)	14, 340	(39. 37)	7, 938	(21. 79)	3, 801	(10. 44)	. 2913	. 1767	. 5320
41. Saga (佐賀)	50, 244	13, 960	(27. 78)	20, 393	(40. 59)	10, 680	(21. 26)	5, 211	(10. 37)	. 2997	. 1731	. 5272
42. Nagasaki (長崎)	30, 492	8, 034	(26. 35)	12, 480	(40. 93)	6, 722	(22. 05)	3, 256	(10. 68)	. 3047	. 1800	. 5153
43. Kumamoto (熊本)	17, 435	4, 969	(28. 50)	7, 112	(40. 79)	3, 543	(20. 32)	1, 811	(10. 39)	. 3009	. 1674	. 5318
44. Oita (大分)	63, 288	18, 319	(28. 95)	25, 147	(39. 73)	13, 572	(21. 44)	6, 250	(9. 88)	. 2902	. 1713	. 5385
45. Miyazaki (宮崎)	42, 159	11, 514	(27. 31)	17, 661	(41. 89)	8, 683	(20. 60)	4, 301	(10. 20)	. 3081	. 1682	. 5237
46. Kagoshima (鹿児島)	388, 851	110, 012	(28. 29)	160, 985	(41. 40)	78, 418	(20. 17)	39, 436	(10. 14)	. 3037	. 1651	. 5312
Total	4, 465, 349	1, 305, 924	(29. 25 ±0. 02)	1, 725, 950	(38. 65 ±0. 02)	988, 996	(22. 15 ±0. 02)	444, 479	(9. 95 ±0. 01)	. 2833	. 1759	. 5407

Fig. 2. Distribution of ABO gene frequencies in Japan. M: Mean of the whole country.

O, 38.65% A, 22.15% B, and 9.95% AB. Gene frequencies are estimated to be $p(I^A)=0.2833$, $q(I^B)=0.1759$, and $r(I^O)=0.5407$.

Table 1 and the equilateral triangle (Fig. 2) indicate gradients of the gene frequencies, the I^A allele being increased and I^B and I^O alleles being decreased from the northeast to the southwest. The distance of each prefecture capital from an arbitrary origin, Aomori, the northernmost of Honshu Island, was measured in 1,000 kilometers along the National Railroads. Hokkaido was excluded from this analysis, since nearly all of the present population of the island consist of relatively recent immigrants from all localities of Japan and their progenies. The relationships between the distances and frequencies of I^A , I^B , and I^O are shown in Figs. 3-5.

The correlation coefficients between the distance and the gene frequencies,

Fig. 3. Gradient of the frequency of I^A allele, p .

Fig. 4. Gradient of the frequency of I^B allele, q .

Fig. 5. Gradient of the frequency of I^O allele, r .

and the regression coefficients of the gene frequencies on the distance are summarized as follows:

	Correlation coefficient	Regression coefficient
p	0.80384	0.02498
q	-0.58602	-0.00610
r	-0.69657	-0.01886

The correlation coefficients are all highly significant at the 0.1% level, with the t values 8.922 for I^A , -4.700 for I^B , and -6.535 for I^O with 43 degrees of freedom.

DISCUSSION

The present analysis of the data on more than four million Japanese collected from the whole country showed the frequencies of ABO blood groups to be O: $29.25 \pm 0.02\%$, A: $38.65 \pm 0.02\%$, B: $22.15 \pm 0.02\%$, and AB: $9.95 \pm 0.01\%$. These figures cannot be regarded as an exact representatives of the Japanese population, since the samples were, by no means, randomly chosen from various subpopulations which are different in the ABO frequencies from each other.

According to Furuhashi (1933), frequencies of ABO blood groups for con-

scripts, 121,200 in number, tested at the physical examination were 29.86% O, 38.23% A, 22.26% B, and 9.65% AB. The sample may be regarded as a nearly ideal representative of Japanese population and the figures were rather similar to those obtained in the present study. On the other hand, there are some indications that the frequencies of ABO blood groups have changed in the recent years. According to Kobayasi (1940), phenotypic frequencies of ABO blood groups in 530,046 Japanese were O: $30.46 \pm 0.06\%$, A: $38.35 \pm 0.07\%$, B: $21.77 \pm 0.06\%$, and AB: $9.42 \pm 0.04\%$. If inhabitants in Okinawa and outside the present territory of Japan were excluded from her materials, the ABO frequencies in remaining 461,313 resided in the 46 prefectures corresponding to the area studied in the present communication are O: 30.43%, A: 38.37%, B: 21.79%, and AB: 9.41%, quite similar to the frequencies obtained from her whole materials.

These figures, however, differ significantly from those obtained by the present study. There are a relative decrease in group O and relative increases in groups A, B, and AB in 30 years. The change is the largest in the O frequency. Similar tendencies are observed in a majority of prefectures. Such differences may be resulted from various causes as follows:

- 1) At least a part of these discrepancies may be only sampling errors.
- 2) There are some evidences that technical errors in blood typing were much more frequent before 10 years or earlier than in the recent days.
- 3) Since, data compiled by Kobayasi and by the present authors were not random samples from each subpopulation of the country, the differences in ABO distributions between the two data may be attributable partly to differences among localities where the samples were taken and the relative size of the samples.
- 4) Recent drastic migration had an important role in the changes of the ABO distribution. According to a report from the Statistic Bureau, Prime Ministry Office (1974), 2.5–4.1% of Japanese population had migrated yearly beyond boundary of prefectures and other 3.2–4.0% within prefecture during the period from 1950 to 1970. Immigration into great cities was most remarkable. The population of Metropolis Tokyo, for instance, has increased from 5.0 millions in 1947 to 11.7 millions in 1975, and more than a half of the increase was estimated to be immigrants from all over the country.

However, the migration has not changed the gradient of ABO distribution; that is, the regression coefficients of I^A , I^B , and I^O gene frequencies on the distances from Aomori are estimated to be 0.02498, -0.00610 , and -0.01886 respectively, which reveal no signs of decrease from the estimates by Nei and Imaizumi (1966), 0.0243, -0.0093 , and -0.0150 respectively based upon data cited from literature published from 1922 to 1963, mostly prior to 1940.

- 5) A systematic decrease in group O may be resulted, at least, from increasing breakdown of isolates in Japan. If a population was composed of many subpopulations differing in the gene frequency from each other, frequency of homozygotes in the entire population may be expressed by

$$\frac{1}{N} \sum_{i=1}^n f_i x_i^2 = \bar{x}^2 + V_x$$

where x_i and f_i are the gene frequency and number of individuals in i -th subpopulation, V_x is the variance of x , and N is the total number of individuals in the entire population.

With the advance of the isolate breakdown, differences in the gene frequency among subpopulations tend to decrease resulting in $V_x \rightarrow 0$. Thus, the frequency of group O, all homozygotes, may decrease, and those of A, B, and AB groups increased, since about 80%, 87% and 100% of these groups, respectively, are heterozygotes in Japanese population. The effects of isolate breakdown on the distribution of ABO blood groups will be discussed in more detail elsewhere.

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REFERENCES

- Akaishi, S. and Kudo, T. 1975. Blood groups. In JIBP Synthesis: Human Adaptability, Vol. 2, Anthropological and Genetic Studies on the Japanese (S. Watanabe, S. Kondo, and E. Matsunaga, eds.), pp. 77-107. Univ. of Tokyo Press, Tokyo.
- Bureau of Statistics, Office of the Prime Ministry, Japan. 1974. Annual Report on the Internal Migration in Japan Derived from the Basic Resident Registers.
- Furuhata, T. 1925. Japanese and Ainu from the viewpoint of serology (in Japanese). *Nihon Gakujutsu Kyokai Hokoku (Proc. Jap. Acad. Soc.)* 1: 325-339.
- Furuhata, T. 1933. On the serological position of the Japanese (in Japanese). *Nihon Gakujutsu Kyokai Hokoku (Proc. Jap. Acad. Soc.)* 8: 564-573.
- Kobayasi, T. 1940. Statistische Beobachtung der Bluttypenverteilung im ABO-System bei Japanern (in Japanese). *Hanzaigaku Zasshi (Archiv für Gerichtliche Medizin und Kriminologie)* 14: 727-735.
- Nei, M. and Imaizumi, Y. 1966. Genetic structure of human populations. I. Local differentiation of blood group gene frequencies in Japan. *Heredity* 21: 9-35.
- Tanaka, T. 1959. A study on the Japanese from the standpoint of the blood groups (in Japanese with English summary). *Hanzaigaku Zasshi (Jap. J. of Legal Med. and Criminol.)* 25: 37-67.

APPENDIX. DISTRIBUTION OF ABO BLOOD GROUPS IN JAPAN FOR HEALTH CENTERS OR ADMINISTRATIVE UNITS

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
I. Hokkaido													
1. Nemuro (根室)	5,153	1,594	(30.93)	1,940	(37.65)	1,131	(21.95)	488	(9.47)	.2727	.1718	.5555	0.094
2. Nakashibetsu (中標津)	6,751	2,071	(30.68)	2,568	(38.04)	1,464	(21.69)	648	(9.60)	.2762	.1709	.5529	0.289
3. Shibecha (標茶)	4,852	1,487	(30.65)	1,830	(37.72)	1,124	(23.17)	411	(8.47)	.2673	.1738	.5589	5.841
4. Kushiro (釧路)	4,748	1,336	(28.14)	1,791	(37.72)	1,118	(23.55)	503	(10.59)	.2811	.1885	.5305	0.000
5. Abashiri (網走)	6,893	2,018	(29.28)	2,628	(38.13)	1,600	(23.21)	647	(9.39)	.2761	.1794	.5445	3.197
6. Bihoro (美幌)	4,403	1,293	(29.37)	1,697	(38.54)	992	(22.53)	421	(9.56)	.2800	.1762	.5439	0.688
7. Kitami (北見)	9,313	2,640	(28.35)	3,672	(39.43)	2,173	(23.33)	828	(8.89)	.2825	.1776	.5399	20.745
8. Engaru (遠軽)	4,997	1,490	(29.82)	1,874	(37.50)	1,116	(22.33)	517	(10.35)	.2774	.1792	.5434	1.386
9. Honbetsu (本別)	2,282	662	(29.01)	888	(38.91)	523	(22.92)	209	(9.16)	.2802	.1764	.5434	2.076
10. Monbetsu (紋別)	4,312	1,332	(30.89)	1,570	(36.41)	985	(22.84)	425	(9.86)	.2666	.1794	.5539	0.620
11. Ikeda (池田)	3,287	953	(28.99)	1,247	(37.94)	745	(22.67)	342	(10.40)	.2810	.1817	.5372	0.195
12. Obihiro (帯広)	5,507	1,724	(31.31)	1,919	(34.85)	1,189	(21.59)	675	(12.26)	.2701	.1849	.5449	46.736
13. Hiroo (広尾)	1,000	285	(28.50)	369	(36.90)	248	(24.80)	98	(9.80)	.2706	.1918	.5376	0.549
14. Shintoku (新得)	2,221	658	(29.63)	847	(38.14)	524	(23.59)	192	(8.64)	.2716	.1776	.5508	3.887
15. Urakawa (浦河)	2,818	867	(30.77)	1,037	(36.80)	628	(22.29)	286	(10.15)	.2710	.1776	.5513	1.313
16. Nayoro (名寄)	6,692	2,008	(30.01)	2,472	(36.94)	1,516	(22.65)	696	(10.40)	.2738	.1814	.5448	2.439
17. Shibetsu (士別)	4,503	1,341	(29.78)	1,741	(38.66)	1,008	(22.39)	413	(9.17)	.2783	.1730	.5487	1.653
18. Asahikawa (旭川)	17,695	5,149	(29.10)	6,750	(38.15)	4,098	(23.16)	1,698	(9.60)	.2776	.1803	.5421	5.112
19. Furano (富良野)	3,549	998	(28.12)	1,351	(38.07)	831	(23.42)	369	(10.40)	.2823	.1865	.5312	0.105
20. Shirunai (静内)	2,879	840	(29.18)	1,074	(37.30)	678	(23.55)	287	(9.97)	.2741	.1848	.5412	0.120
21. Ashibetsu (芦別)	5,396	1,594	(29.54)	1,985	(36.79)	1,301	(24.11)	516	(9.56)	.2680	.1859	.5461	1.466
22. Fukagawa (深川)	8,067	2,363	(29.29)	3,200	(39.67)	1,719	(21.31)	785	(9.73)	.2887	.1696	.5416	0.058
23. Wakkanai (稚内)	9,187	2,877	(31.32)	3,318	(36.12)	2,118	(23.05)	874	(9.51)	.2625	.1787	.5588	0.273
24. Teshio (天塩)	2,543	782	(30.75)	941	(37.00)	564	(22.18)	256	(10.07)	.2719	.1765	.5515	0.955
25. Rumoi (留萌)	9,072	2,756	(30.38)	3,401	(37.49)	2,000	(22.35)	915	(10.09)	.2755	.1759	.5486	2.435

continued

Fig. 6. Hokkaido (Prefecture I).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
26. Takikawa (滝川)	6,029	1,773	(29.41)	2,293	(38.03)	1,376	(22.82)	587	(9.74)	.2775	.1789	.5436	0.388
27. Sunagawa (砂川)	5,570	1,652	(29.66)	2,043	(36.68)	1,327	(23.82)	548	(9.84)	.2688	.1856	.5455	0.191
28. Bibai (美保)	3,219	942	(29.26)	1,273	(39.55)	692	(21.50)	312	(9.69)	.2877	.1706	.5418	0.082
29. Iwamizawa (岩見沢)	7,086	2,090	(29.49)	2,577	(36.37)	1,727	(24.37)	692	(9.77)	.2664	.1887	.5449	0.970
30. Yubari (夕張)	3,627	1,069	(29.47)	1,416	(39.04)	806	(22.22)	336	(9.26)	.2815	.1726	.5459	1.304
31. Yuni (由仁)	5,551	1,691	(30.46)	2,119	(38.17)	1,226	(22.09)	515	(9.28)	.2753	.1717	.5531	0.294
32. Tobetsu (当別)	4,621	1,413	(30.58)	1,771	(38.33)	1,041	(22.53)	396	(8.57)	.2721	.1704	.5575	4.105
33. Ebetsu (江別)	5,065	1,557	(30.74)	1,899	(37.49)	1,137	(22.45)	472	(9.32)	.2708	.1740	.5551	0.104
34. Chitose (千歳)	1,911	580	(30.35)	702	(36.73)	442	(23.13)	187	(9.79)	.2686	.1809	.5505	0.015
35. Tomakomai (苫小牧)	6,154	1,851	(30.08)	2,259	(36.71)	1,384	(22.49)	660	(10.72)	.2741	.1822	.5437	5.576
36. Sapporo (札幌)	5,540	1,540	(27.80)	2,079	(37.53)	1,351	(24.39)	570	(10.29)	.2781	.1921	.5298	1.388
37. Otaru (小樽)	37,358	11,755	(31.47)	13,599	(36.40)	8,536	(22.85)	3,468	(9.28)	.2630	.1762	.5608	0.019
38. Muroran (室蘭)	8,054	2,447	(30.38)	2,914	(36.18)	1,909	(23.70)	784	(9.73)	.2646	.1841	.5513	0.001
39. Yoichi (余市)	4,330	1,294	(29.88)	1,644	(37.97)	976	(22.54)	416	(9.61)	.2761	.1764	.5475	0.130
40. Kutchan (倶知安)	9,536	2,879	(30.19)	3,415	(35.81)	2,358	(24.73)	884	(9.27)	.2595	.1880	.5526	3.811
41. Iwanai (岩内)	3,372	1,076	(31.91)	1,197	(35.50)	785	(23.28)	314	(9.31)	.2570	.1789	.5641	0.083
42. Mori (森)	3,086	967	(31.34)	1,074	(34.80)	753	(24.40)	292	(9.46)	.2534	.1868	.5598	0.000
43. Hakodate (函館)	3,783	1,159	(30.64)	1,360	(35.95)	926	(24.48)	338	(8.93)	.2582	.1844	.5573	2.305
44. Oshima (渡島)	1,384	321	(23.19)	535	(38.66)	386	(27.89)	142	(10.26)	.2881	.2156	.4962	9.535
45. Kikonai (木古内)	9,614	3,051	(31.73)	3,453	(35.92)	2,235	(23.25)	875	(9.10)	.2586	.1776	.5639	0.114
46. Yakumo (八雲)	6,170	1,861	(30.16)	2,234	(36.21)	1,521	(24.65)	554	(8.98)	.2604	.1859	.5537	5.231
47. Imagane (今金)	2,195	682	(31.07)	797	(36.31)	492	(22.41)	224	(10.21)	.2680	.1787	.5534	1.501
48. Esashi (江差)	2,096	643	(30.68)	757	(36.12)	480	(22.90)	216	(10.31)	.2674	.1823	.5503	1.102
Total	283,471	85,411	(30.13)	105,520	(37.22)	65,259	(23.02)	27,281	(9.62)	.2711	.1794	.5495	4.923

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
2. Aomori													
1. Aomori (青森)	7,006	2,277	(32.50)	2,336	(33.34)	1,773	(25.31)	620	(8.85)	.2399	.1887	.5714	0.526
2. Hirosaki (弘前)	11,191	3,793	(33.89)	3,562	(31.83)	2,835	(25.33)	1,001	(8.94)	.2302	.1891	.5807	1.159
3. Hachinohe (八戸)	13,006	4,391	(33.76)	4,244	(32.63)	3,216	(24.73)	1,155	(8.88)	.2351	.1850	.5799	0.787
Total	31,203	10,461	(33.53)	10,142	(32.50)	7,824	(25.07)	2,776	(8.90)	.2344	.1873	.5783	0.755
3. Iwate													
1. Kuji (久慈)	5,950	2,124	(35.70)	1,886	(31.70)	1,497	(25.16)	443	(7.45)	.2203	.1794	.6003	2.470
2. Iwaizumi (岩泉)	1,206	422	(34.99)	457	(37.89)	244	(20.23)	83	(6.88)	.2576	.1467	.5958	1.145
3. Miyako (宮古)	6,267	2,226	(35.52)	2,327	(37.13)	1,277	(20.38)	437	(6.97)	.2529	.1479	.5992	3.424
4. Ofunato (大船渡)	5,249	1,625	(30.96)	1,983	(37.78)	1,164	(22.18)	477	(9.09)	.2713	.1711	.5577	0.352
5. Daito (大東)	4,225	1,244	(29.44)	1,623	(38.41)	930	(22.01)	428	(10.13)	.2825	.1761	.5414	0.237
6. Iwate (岩手)	462	183	(39.61)	146	(31.60)	101	(21.86)	32	(6.93)	.2158	.1560	.6282	0.038
7. Morioka (盛岡)	18,740	6,034	(32.20)	6,320	(33.72)	4,638	(24.75)	1,748	(9.33)	.2453	.1880	.5668	0.377
8. Kitakami (北上)	4,546	1,541	(33.90)	1,542	(33.92)	1,094	(24.07)	369	(8.12)	.2390	.1767	.5843	0.934
9. Esashi (江刺)	921	292	(31.70)	320	(34.74)	230	(24.97)	79	(8.58)	.2478	.1853	.5669	0.600
10. Mizusawa (水沢)	6,835	2,322	(33.97)	2,470	(36.14)	1,490	(21.80)	553	(8.09)	.2534	.1628	.5839	0.331
11. Ichinoseki (一関)	1,090	319	(29.27)	410	(37.61)	251	(23.03)	110	(10.09)	.2769	.1822	.5410	0.000
Total	55,491	18,332	(33.04)	19,484	(35.11)	12,916	(23.28)	4,759	(8.58)	.2499	.1747	.5754	2.124
4. Miyagi													
1. Kesennuma (気仙沼)	9,263	2,807	(30.30)	3,396	(36.66)	2,152	(23.23)	908	(9.80)	.2683	.1816	.5501	0.053
2. Wakuya (涌谷)	65,284	21,185	(32.45)	23,447	(35.92)	14,731	(22.56)	5,921	(9.07)	.2581	.1731	.5688	2.153
3. Tsukidate (築館)	3,573	1,196	(33.47)	1,290	(36.10)	764	(21.38)	323	(9.04)	.2589	.1656	.5756	1.476
4. Furukawa (古川)	2,823	842	(29.83)	1,054	(37.34)	680	(24.09)	247	(8.75)	.2668	.1812	.5521	4.111
5. Sendai-Higashi (仙台東)	4,566	1,417	(31.03)	1,660	(36.36)	1,073	(23.50)	416	(9.11)	.2618	.1793	.5589	0.623

continued

Fig. 7. Tohoku District (Prefectures 2-7).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
6. Sendai-Minami (仙台南)	10,772	3,427	(31.81)	3,844	(35.69)	2,552	(23.69)	949	(8.81)	.2553	.1786	.5660	1.888
7. Sendai-Kita (仙台北)	4,282	1,317	(30.76)	1,631	(38.09)	1,006	(23.49)	328	(7.66)	.2650	.1713	.5637	15.730
8. Miyakuro (宮黒)	1,255	415	(33.07)	443	(35.30)	298	(23.75)	99	(7.89)	.2469	.1736	.5794	1.117
Subtotal	101,818	32,606	(32.02)	36,765	(36.11)	23,256	(22.84)	9,191	(9.03)	.2593	.1746	.5660	0.150
Prefectural Health Depart.	141,480	42,572	(30.09)	52,204	(36.90)	32,403	(22.90)	14,301	(10.11)	.2717	.1813	.5470	13.700
Grand total	243,298	75,178	(30.90)	88,969	(36.57)	55,659	(22.88)	23,492	(9.66)	.2665	.1785	.5550	8.345
5. Akita													
1. Kazuno (鹿角)	9,654	3,182	(32.96)	3,062	(31.72)	2,583	(26.76)	827	(8.57)	.2276	.1961	.5764	2.223
2. Odate (大館)	11,178	3,594	(32.15)	3,678	(32.90)	2,859	(25.58)	1,047	(9.37)	.2401	.1934	.5665	0.127
3. Kakunodate (角館)	7,720	2,526	(32.72)	2,753	(35.66)	1,751	(22.68)	690	(8.94)	.2556	.1730	.5714	0.126
4. Omagari (大曲)	6,908	2,123	(30.73)	2,389	(34.58)	1,737	(25.14)	659	(9.54)	.2527	.1919	.5554	0.301
5. Yokote (横手)	5,424	1,533	(28.26)	1,941	(35.79)	1,440	(26.55)	510	(9.40)	.2608	.2006	.5386	9.974
6. Yuzawa (湯沢)	13,041	3,982	(30.53)	4,702	(36.06)	3,149	(24.15)	1,208	(9.26)	.2609	.1842	.5548	2.781
7. Takanosu (鷹巣)	18,844	5,893	(31.27)	6,408	(34.01)	4,823	(25.59)	1,720	(9.13)	.2462	.1923	.5614	3.884
8. Noshiro (能代)	18,067	5,759	(31.88)	6,148	(34.03)	4,829	(26.73)	1,331	(7.37)	.2360	.1894	.5746	81.578
9. Gojome (五城目)	8,424	2,718	(32.26)	2,956	(35.09)	2,031	(24.11)	719	(8.54)	.2496	.1796	.5708	2.850
10. Akita (秋田)	19,982	6,510	(32.58)	6,982	(34.94)	4,793	(23.99)	1,697	(8.49)	.2483	.1786	.5732	5.112
11. Honjo (本荘)	8,956	2,550	(28.47)	3,345	(37.35)	2,150	(24.01)	911	(10.17)	.2759	.1889	.5352	0.918
12. Yajima (矢島)	1,263	416	(32.94)	382	(30.25)	335	(26.52)	130	(10.29)	.2280	.2043	.5677	2.090
13. Oga (男鹿)	8,411	2,436	(28.96)	2,917	(34.68)	2,080	(24.73)	978	(11.63)	.2662	.2015	.5323	10.766
Total	137,872	43,222	(31.35)	47,663	(34.57)	34,560	(25.07)	12,427	(9.01)	.2494	.1884	.5622	34.643

continued

Health center or district	N	O		A		B		AB		p	q	r	χ²
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
6. Yamagata													
1. Yamagata (山形)	12,978	4,005	(30.86)	4,782	(36.85)	2,944	(22.68)	1,247	(9.61)	.2681	.1771	.5548	0.287
2. Sagae (寒河江)	5,919	1,863	(31.47)	2,133	(36.04)	1,372	(23.18)	551	(9.31)	.2607	.1783	.5610	0.001
3. Yonezawa (米沢)	6,181	1,786	(28.90)	2,382	(38.54)	1,379	(22.31)	634	(10.26)	.2843	.1788	.5369	0.089
Subtotal	25,078	7,654	(30.52)	9,297	(37.07)	5,695	(22.71)	2,432	(9.70)	.2704	.1778	.5518	0.322
Prefectural Health Depart.	21,387	6,605	(30.88)	7,734	(36.16)	5,036	(23.55)	2,012	(9.41)	.2623	.1813	.5564	0.440
Grand total	46,465	14,259	(30.69)	17,031	(36.65)	10,731	(23.09)	4,444	(9.56)	.2666	.1794	.5540	0.000
7. Fukushima													
Red Cross Blood Center	46,804	14,619	(31.23)	17,644	(37.70)	10,261	(21.92)	4,280	(9.14)	.2710	.1698	.5592	0.272
8. Ibaraki													
1. Nakaminato (那珂湊)	809	234	(28.92)	300	(37.08)	191	(23.61)	84	(10.38)	.2751	.1875	.5374	0.006
2. Hitachiota (常陸太田)	2,137	670	(31.35)	811	(37.95)	466	(21.81)	190	(8.89)	.2711	.1677	.5612	0.155
3. Mito (水戸)	1,907	552	(28.95)	731	(38.33)	435	(22.81)	189	(9.91)	.2808	.1799	.5393	0.120
4. Hokota (鉾田)	1,218	341	(28.00)	447	(36.70)	331	(27.18)	99	(8.13)	.2595	.1974	.5430	9.155
5. Itako (潮来)	999	335	(33.53)	324	(32.43)	249	(24.92)	91	(9.11)	.2351	.1876	.5773	0.150
6. Omiya (大宮)	1,776	501	(28.21)	630	(35.47)	418	(23.54)	227	(12.78)	.2787	.2006	.5206	6.945
7. Tsuchiura (土浦)	1,397	442	(31.64)	547	(39.16)	271	(19.40)	137	(9.81)	.2846	.1581	.5573	1.671
8. Ryugasaki (竜ヶ崎)	7,279	2,146	(29.48)	2,805	(38.54)	1,653	(22.71)	675	(9.27)	.2781	.1756	.5462	3.111
9. Shimodate (下館)	3,438	996	(28.97)	1,311	(38.13)	771	(22.43)	360	(10.47)	.2828	.1806	.5366	0.371
Subtotal	20,960	6,217	(29.66)	7,906	(37.72)	4,785	(22.83)	2,052	(9.79)	.2757	.1793	.5451	0.276

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
Prefectural Health Depart.	45,468	13,721	(30.18)	17,008	(37.41)	10,340	(22.74)	4,399	(9.67)				
Grand total	66,428	19,938	(30.01)	24,914	(37.51)	15,125	(22.77)	6,451	(9.71)	.2735	.1783	.5481	0.225
9. Tochigi													
1. Otahara (大田原)	5,422	1,736	(32.02)	1,953	(36.02)	1,328	(24.49)	405	(7.47)	.2496	.1761	.5743	17.601
2. Moka (真岡)	6,476	1,868	(28.84)	2,466	(38.08)	1,577	(24.35)	565	(8.72)	.2720	.1829	.5451	16.604
3. Imaichi (今市)	4,940	1,467	(29.70)	1,790	(36.23)	1,207	(24.43)	476	(9.64)	.2646	.1883	.5471	0.905
4. Sano (佐野)	180	58	(32.22)	70	(38.89)	36	(20.00)	16	(8.89)	.2771	.1566	.5663	0.015
5. Ashikaga (足利)	3,311	860	(25.97)	1,343	(40.56)	780	(23.56)	328	(9.91)	.2977	.1852	.5171	6.650
Total	20,329	5,989	(29.46)	7,622	(37.49)	4,928	(24.24)	1,790	(8.81)	.2685	.1825	.5490	34.147
10. Gunma													
1. Tatebayashi (館林)	2,780	776	(27.91)	1,085	(39.03)	659	(23.71)	260	(9.35)	.2827	.1826	.5347	4.363
2. Fujioka (藤岡)	245	67	(27.35)	116	(47.35)	46	(18.78)	16	(6.53)	.3241	.1371	.5386	2.688
3. Annaka (安中)	2,529	699	(27.64)	960	(37.96)	609	(24.08)	261	(10.32)	.2813	.1904	.5283	0.623
Subtotal	5,554	1,542	(27.76)	2,161	(38.91)	1,314	(23.66)	537	(9.67)	.2839	.1841	.5320	5.599
Red Cross Blood Center	272,197	82,256	(30.22)	101,524	(37.30)	60,890	(22.37)	27,527	(10.11)				
Grand total	277,751	83,798	(30.17)	103,685	(37.33)	62,204	(22.40)	28,064	(10.10)	.2746	.1782	.5472	48.072
11. Saitama													
1. Yoshikawa (吉川)	450	124	(27.56)	184	(40.89)	104	(23.11)	38	(8.44)	.2902	.1739	.5358	2.103
2. Kasukabe (春日部)	3,394	918	(27.05)	1,358	(40.01)	819	(24.13)	299	(8.81)	.2866	.1824	.5309	15.304
3. Kazo (加須)	768	240	(31.25)	272	(35.42)	171	(22.27)	85	(11.07)	.2670	.1825	.5505	2.276
4. Konosu (鴻巣)	2,572	758	(29.47)	1,009	(39.23)	564	(21.93)	241	(9.37)	.2835	.1714	.5451	0.538
5. Yorii (寄居)	483	138	(28.57)	195	(40.37)	103	(21.33)	47	(9.73)	.2939	.1699	.5362	0.054
6. Soka (草加)	4,417	1,334	(30.20)	1,661	(37.60)	1,000	(22.64)	422	(9.55)	.2732	.1766	.5502	0.071

continued

Fig. 8. Kanto District (Prefectures 8-14).

Fig. 9. A part of Kanto District (Tokyo and its neighborhood).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
7. Toda-Warabi (戸田・蕨)	732	206	(28.14)	261	(35.66)	164	(22.40)	101	(13.80)	.2860	.1992	.5147	6.353
8. Asaka (朝霞)	301	76	(25.25)	129	(42.86)	59	(19.60)	37	(12.29)	.3291	.1741	.4969	0.329
9. Tokorozawa (所沢)	39,872	11,446	(28.71)	15,212	(38.15)	9,151	(22.95)	4,063	(10.19)	.2814	.1824	.5363	0.350
Total	52,989	15,240	(28.76)	20,281	(38.27)	12,135	(22.90)	5,333	(10.06)	.2814	.1814	.5372	1.811
12. Chiba													
1. Mobara (茂原)	1,002	305	(30.44)	356	(35.53)	254	(25.35)	87	(8.68)	.2540	.1885	.5575	1.390
2. Sakura (佐倉)	2,950	884	(29.97)	1,107	(37.53)	684	(23.19)	275	(9.32)	.2714	.1788	.5499	0.735
3. Chuo (中央)	292	96	(32.88)	89	(30.48)	78	(26.71)	29	(9.93)	.2274	.2035	.5691	0.233
4. Kamogawa (鴨川)	1,585	438	(27.63)	594	(37.48)	394	(24.86)	159	(10.03)	.2763	.1936	.5301	1.141
5. Kashiwa (柏)	1,706	473	(27.73)	647	(37.92)	420	(24.62)	166	(9.73)	.2775	.1904	.5321	1.955
6. Kisarazu (木更津)	1,616	476	(29.46)	574	(35.52)	402	(24.88)	164	(10.15)	.2630	.1940	.5431	0.007
7. Tateyama (館山)	3,079	888	(28.84)	1,158	(37.61)	741	(24.07)	292	(9.48)	.2734	.1853	.5413	2.181
8. Noda (野田)	1,588	466	(29.35)	570	(35.89)	344	(21.66)	208	(13.10)	.2830	.1904	.5265	13.424
Total	13,818	4,026	(29.14)	5,095	(36.87)	3,317	(24.00)	1,380	(9.99)	.2713	.1877	.5410	0.879
13. Tokyo													
1. Katsushika (葛飾)	933	257	(27.55)	364	(39.01)	222	(23.79)	90	(9.65)	.2845	.1849	.5306	1.170
2. Edogawa (江戸川)	996	298	(29.92)	367	(36.85)	229	(22.99)	102	(10.24)	.2723	.1827	.5451	0.146
3. Adachi (足立)	2,546	740	(29.07)	934	(36.68)	579	(22.74)	293	(11.51)	.2790	.1883	.5326	4.084
4. Sumida (墨田)	1,404	357	(25.43)	539	(38.39)	337	(24.00)	171	(12.18)	.2966	.2009	.5025	0.144
5. Koto (江東)	1,525	457	(29.97)	566	(37.11)	333	(21.84)	169	(11.08)	.2790	.1802	.5408	2.678
6. Arakawa (荒川)	3,954	1,035	(26.18)	1,568	(39.66)	889	(22.48)	462	(11.68)	.3020	.1884	.5096	0.570
7. Taito (台東)	2,162	624	(28.86)	813	(37.60)	480	(22.20)	245	(11.33)	.2844	.1841	.5316	2.626
8. Chuo (中央)	4,207	1,249	(29.69)	1,546	(36.75)	967	(22.99)	445	(10.58)	.2737	.1845	.5418	1.591
9. Kita (北)	1,730	531	(30.69)	638	(36.88)	348	(20.12)	213	(12.31)	.2844	.1763	.5392	14.975

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
10. Bunkyo (文京)	2,161	622	(28.78)	833	(38.55)	480	(22.21)	226	(10.46)	.2856	.1793	.5351	0.168
11. Chiyoda (千代田)	3,354	946	(28.21)	1,313	(39.15)	766	(22.84)	329	(9.81)	.2861	.1797	.5342	1.252
12. Minato (港)	4,068	1,169	(28.74)	1,521	(37.39)	945	(23.23)	433	(10.64)	.2788	.1866	.5345	0.370
13. Itabashi (板橋)	2,903	780	(26.87)	1,157	(39.86)	683	(23.53)	283	(9.75)	.2913	.1839	.5247	4.422
14. Toshima (豊島)	1,394	402	(28.84)	539	(38.67)	306	(21.95)	147	(10.55)	.2869	.1782	.5349	0.240
15. Shinjuku (新宿)	1,738	504	(29.00)	677	(38.95)	379	(21.81)	178	(10.24)	.2870	.1755	.5374	0.079
16. Shibuya (渋谷)	1,319	373	(28.28)	485	(36.77)	306	(23.20)	155	(11.75)	.2814	.1927	.5258	1.701
17. Meguro (目黒)	935	269	(28.77)	343	(36.68)	243	(25.99)	80	(8.56)	.2616	.1922	.5461	3.554
18. Shinagawa (品川)	1,990	564	(28.34)	763	(38.34)	467	(23.47)	196	(9.85)	.2808	.1838	.5354	0.730
19. Ota (大田)	5,554	1,524	(27.44)	2,180	(39.25)	1,269	(22.85)	581	(10.46)	.2911	.1835	.5253	0.460
20. Nerima (練馬)	1,382	376	(27.21)	503	(36.40)	323	(23.37)	180	(13.02)	.2869	.2012	.5118	4.536
21. Nakano (中野)	1,543	442	(28.65)	577	(37.39)	363	(23.53)	161	(10.43)	.2777	.1873	.5350	0.003
22. Suginami (杉並)	3,351	958	(28.59)	1,262	(37.66)	767	(22.89)	364	(10.86)	.2821	.1858	.5322	0.800
23. Setagaya (世田谷)	4,595	1,314	(28.60)	1,773	(38.59)	1,068	(23.24)	440	(9.58)	.2807	.1808	.5385	2.544
24. Musashino (武蔵野)	910	269	(29.56)	345	(37.91)	215	(23.63)	81	(8.90)	.2717	.1792	.5391	1.100
25. Mitaka (三鷹)	1,010	254	(25.15)	404	(40.00)	232	(22.97)	120	(11.88)	.3062	.1928	.5010	0.008
26. Musashi-Chofu (武蔵調布)	430	107	(24.88)	176	(40.93)	105	(24.42)	42	(9.77)	.3000	.1901	.5098	1.816
27. Tanashi (田無)	422	126	(29.86)	165	(39.10)	93	(22.04)	38	(9.00)	.2802	.1700	.5498	0.202
28. Koganei (小金井)	1,266	323	(25.51)	504	(39.81)	297	(23.46)	142	(11.22)	.3006	.1920	.5073	0.213
29. Kodaira (小平)	1,475	443	(30.03)	561	(38.03)	312	(21.15)	159	(10.78)	.2835	.1743	.5422	2.015
30. Fuchu (府中)	388	91	(23.45)	158	(40.72)	107	(27.58)	32	(8.25)	.2901	.2020	.5077	7.283
31. Machida (町田)	1,314	370	(28.16)	492	(37.44)	297	(22.60)	155	(11.80)	.2863	.1893	.5244	1.900
32. Tachikawa (立川)	416	117	(28.13)	163	(39.18)	89	(21.39)	47	(11.30)	.2954	.1790	.5256	0.352
33. Hino (日野)	396	119	(30.05)	155	(39.14)	84	(21.21)	38	(9.60)	.2840	.1682	.5479	0.001

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
34. Hachioji (八王子)	1,084	306	(28.23)	432	(39.85)	238	(21.96)	108	(9.96)	.2919	.1751	.5330	0.122
35. Ome (管梅)	6,287	1,823	(29.00)	2,510	(39.92)	1,327	(21.11)	627	(9.97)	.2921	.1698	.5381	0.032
36. Itsukaichi (五日市)	1,045	314	(30.05)	398	(38.09)	226	(21.63)	107	(10.24)	.2806	.1742	.5452	0.381
Subtotal	72,187	20,453	(28.33)	27,724	(38.41)	16,371	(22.68)	7,639	(10.58)	.2857	.1830	.5313	2.037
Prefectural Health Depart.	101,436	29,932	(29.51)	38,846	(38.30)	22,614	(22.29)	10,044	(9.90)	.2803	.1766	.5432	0.002
Others	120,065	35,202	(29.32)	45,830	(38.17)	26,864	(22.37)	12,169	(10.14)	.2809	.1784	.5407	2.635
Grand total	293,688	85,587	(29.14)	112,400	(38.27)	65,849	(22.42)	29,852	(10.16)	.2818	.1789	.5393	3.331
14. Kanagawa													
1. Daishi (川崎大師)	4,003	1,218	(30.43)	1,482	(37.02)	918	(22.93)	385	(9.62)	.2695	.1787	.5517	0.002
2. Saiwai (川崎幸)	4,215	1,215	(28.83)	1,596	(37.86)	998	(23.68)	406	(9.63)	.2760	.1838	.5402	1.847
3. Nakahara (川崎中原)	1,429	430	(30.09)	550	(38.49)	299	(20.92)	150	(10.50)	.2849	.1713	.5438	1.325
4. Takatsu (川崎高津)	3,366	988	(29.35)	1,303	(38.71)	791	(23.50)	284	(8.44)	.2744	.1759	.5497	8.710
5. Yokohama- Minami (横浜南)	2,129	565	(26.54)	842	(39.55)	503	(23.63)	219	(10.29)	.2926	.1876	.5198	1.635
6. Yokohama- Midori (横浜緑)	4,199	1,216	(28.96)	1,650	(39.30)	944	(22.48)	389	(9.26)	.2835	.1743	.5422	2.767
7. Sagami-hara (相模原)	2,246	623	(27.74)	891	(39.67)	501	(22.31)	231	(10.28)	.2928	.1791	.5280	0.157
8. Atsugi (厚木)	1,572	476	(30.28)	588	(37.40)	326	(20.74)	182	(11.58)	.2838	.1761	.5400	6.563
9. Kanazawa (横浜金沢)	1,644	463	(28.16)	610	(37.10)	397	(24.15)	174	(10.58)	.2768	.1922	.5310	0.008
10. Yokosuka-Kita (横浜北)	970	272	(28.04)	381	(39.28)	205	(21.13)	112	(11.55)	.2976	.1788	.5236	1.281
11. Fujisawa (藤沢)	2,331	609	(26.13)	932	(39.98)	552	(23.68)	238	(10.21)	.2954	.1876	.5170	2.838

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
12. Chigasaki (茅ヶ崎)	533	165	(30.96)	210	(39.40)	103	(19.32)	55	(10.32)	.2897	.1605	.5498	0.989
13. Ashigarakami (足柄上)	2,325	687	(29.55)	939	(40.39)	466	(20.04)	233	(10.02)	.2953	.1635	.5412	0.545
14. Odawara (小田原)	2,498	785	(31.43)	918	(36.75)	534	(21.38)	261	(10.45)	.2722	.1736	.5542	4.329
Total	33,460	9,712	(29.03)	12,892	(38.53)	7,537	(22.53)	3,319	(9.92)	.2822	.1782	.5395	1.050
15. Niigata													
1. Tsugawa (津川)	5,577	1,680	(30.12)	2,215	(39.72)	1,176	(21.09)	506	(9.07)	.2847	.1645	.5508	0.867
2. Niigata-Higashi (新潟東)	15,960	4,375	(27.41)	6,092	(38.17)	3,823	(23.95)	1,670	(10.46)	.2837	.1905	.5258	3.010
3. Niigata-Nishi (新潟西)	7,440	2,155	(28.97)	2,799	(37.62)	1,702	(22.88)	784	(10.54)	.2797	.1838	.5365	0.808
4. Maki (巻)	26,032	7,081	(27.20)	10,342	(39.73)	5,893	(22.64)	2,716	(10.43)	.2944	.1821	.5235	3.560
5. Sanjo (三上)	650	172	(26.46)	247	(38.00)	164	(25.23)	67	(10.31)	.2821	.1979	.5201	0.744
6. Yoita (与板)	4,527	1,229	(27.15)	1,775	(39.21)	1,034	(22.84)	489	(10.80)	.2931	.1855	.5215	0.033
7. Tochio (栃尾)	5,098	1,359	(26.66)	1,848	(36.25)	1,321	(25.91)	570	(11.18)	.2752	.2071	.5177	0.363
8. Muikamachi (六日町)	1,808	563	(31.14)	692	(38.27)	398	(22.01)	155	(8.57)	.2715	.1672	.5613	0.845
9. Tokamachi (十日町)	14,921	4,373	(29.31)	5,881	(39.41)	3,174	(21.27)	1,493	(10.01)	.2886	.1709	.5405	0.501
10. Kashiwazaki (柏崎)	3,904	1,171	(29.99)	1,494	(38.27)	855	(21.90)	384	(9.84)	.2795	.1737	.5468	0.111
Total	85,917	24,158	(28.12)	33,385	(38.86)	19,540	(22.74)	8,834	(10.28)	.2871	.1818	.5311	3.187
16. Toyama													
1. Kurobe (黒部)	2,210	617	(27.92)	827	(37.42)	569	(25.75)	197	(8.91)	.2691	.1929	.5380	7.865
2. Himi (氷見)	4,751	1,370	(28.84)	1,970	(41.46)	976	(20.54)	435	(9.16)	.2979	.1619	.5402	2.013
Total	6,961	1,987	(28.54)	2,797	(40.18)	1,545	(22.20)	632	(9.08)	.2888	.1717	.5395	8.245

continued

Fig. 10. Chubu District (Prefectures 15-23).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
17. Ishikawa													
17. Suzu (珠洲)	1,847	523	(28.32)	605	(32.76)	532	(28.80)	187	(10.12)	.2449	.2191	.5361	1.069
2. Udetsu (宇出津)	1,734	543	(31.31)	520	(29.99)	507	(29.24)	164	(9.46)	.2220	.2172	.5608	0.102
3. Monzen (門前)	2,378	797	(33.52)	803	(33.77)	575	(24.18)	203	(8.54)	.2405	.1798	.5796	0.057
4. Nanao (七尾)	6,374	2,016	(31.63)	2,445	(38.36)	1,365	(21.42)	548	(8.60)	.2720	.1636	.5643	1.093
5. Komatsu (小松)	2,554	727	(28.47)	988	(38.68)	597	(23.38)	242	(9.48)	.2808	.1811	.5381	2.075
Total	14,887	4,606	(30.94)	5,361	(36.01)	3,576	(24.02)	1,344	(9.03)	.2593	.1823	.5584	4.308
18. Fukui													
1. Katsuyama (勝山)	1,651	473	(28.65)	615	(37.25)	398	(24.11)	165	(9.99)	.2741	.1885	.5375	0.310
2. Ono (大野)	783	221	(28.22)	303	(38.70)	191	(24.39)	68	(8.68)	.2763	.1830	.5406	2.713
3. Fukui (福井)	2,991	862	(28.82)	1,155	(38.62)	685	(22.90)	289	(9.66)	.2813	.1791	.5396	0.873
4. Sabae (鯖江)	1,756	474	(26.99)	723	(41.17)	383	(21.81)	176	(10.02)	.3021	.1748	.5231	0.838
Subtotal	7,181	2,030	(28.27)	2,796	(38.94)	1,657	(23.07)	698	(9.72)	.2842	.1806	.5352	3.545
Red Cross Blood Center	187,714	56,304	(29.99)	71,707	(38.20)	42,595	(22.69)	17,108	(9.11)				
Grand total	194,895	58,334	(29.93)	74,503	(38.23)	44,252	(22.71)	17,806	(9.14)	.2750	.1748	.5502	77.556
19. Yamanashi													
1. Kusakabe (日下部)	437	123	(28.15)	176	(40.27)	100	(22.88)	38	(8.70)	.2872	.1738	.5390	1.245
2. Kofu (甲府)	4,119	1,046	(25.39)	1,582	(38.41)	1,068	(25.93)	423	(10.27)	.2852	.2024	.5124	10.268
Subtotal	4,556	1,169	(25.66)	1,758	(38.59)	1,168	(25.64)	461	(10.12)	.2854	.1996	.5150	11.463
Red Cross Blood Center	765	217	(28.37)	307	(40.13)	165	(21.57)	76	(9.93)	.2936	.1725	.5338	0.045
Blood Center	10,350	3,098	(29.93)	3,812	(36.83)	2,331	(22.52)	1,109	(10.71)	.2749	.1824	.5427	1.988
Grand total	15,671	4,484	(28.61)	5,877	(37.50)	3,664	(23.38)	1,646	(10.50)	.2788	.1868	.5344	0.188

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
20. Nagano													
1. Iiyama (飯山)	8,967	2,347	(26.17)	3,819	(42.59)	1,975	(22.03)	826	(9.21)	.3076	.1718	.5206	27.509
2. Nakano (中野)	14,218	3,595	(25.28)	5,360	(37.70)	3,471	(24.41)	1,792	(12.60)	.2944	.2059	.4996	4.755
3. Susaka (須坂)	12,032	3,446	(28.64)	4,477	(37.21)	2,948	(24.50)	1,161	(9.65)	.2717	.1890	.5392	7.752
4. Komoro (小諸)	13,577	3,760	(27.69)	5,041	(37.13)	3,259	(24.00)	1,517	(11.17)	.2807	.1947	.5246	1.284
5. Saku (佐久)	17,229	4,876	(28.30)	6,381	(37.04)	4,146	(24.06)	1,826	(10.60)	.2764	.1917	.5320	0.000
6. Nagano (長野)	42,204	13,645	(32.33)	15,412	(36.52)	9,072	(21.50)	4,075	(9.66)	.2656	.1698	.5645	30.671
7. Shinonoi (篠ノ井)	16,266	4,971	(30.56)	6,052	(37.21)	3,568	(21.94)	1,675	(10.30)	.2748	.1763	.5489	10.301
8. Matsushiro (松代)	12,888	3,680	(28.55)	4,981	(38.65)	2,970	(23.04)	1,257	(9.75)	.2822	.1806	.5372	4.144
9. Ueda (上田)	16,775	4,733	(28.21)	6,252	(37.27)	4,061	(24.21)	1,729	(10.31)	.2762	.1910	.5328	1.625
10. Omachi (大町)	15,580	4,682	(30.05)	5,503	(35.32)	3,951	(25.36)	1,444	(9.27)	.2562	.1919	.5519	8.500
11. Toyoshima (豊科)	21,179	6,566	(31.00)	7,738	(36.54)	4,854	(22.92)	2,021	(9.54)	.2656	.1781	.5563	0.241
12. Matsumoto (松本)	56,259	17,474	(31.06)	20,604	(36.62)	12,987	(23.08)	5,194	(9.23)	.2643	.1774	.5583	2.135
13. Okaya (岡谷)	18,459	5,216	(28.26)	6,998	(37.91)	4,303	(23.31)	1,942	(10.52)	.2819	.1866	.5316	0.000
14. Suwa (諏訪)	20,816	6,005	(28.85)	7,778	(37.37)	4,913	(23.60)	2,120	(10.18)	.2759	.1864	.5377	0.334
15. Ina (伊那)	23,215	7,417	(31.95)	7,812	(33.65)	5,805	(25.01)	2,181	(9.39)	.2452	.1900	.5648	0.231
16. Iida (飯田)	22,374	6,641	(29.68)	8,512	(38.04)	4,782	(21.37)	2,439	(10.90)	.2844	.1764	.5392	28.209
17. Kiso (木曾)	16,899	4,672	(27.65)	6,813	(40.32)	3,672	(21.73)	1,742	(10.31)	.2975	.1757	.5268	0.606
Total	348,937	103,726	(29.73)	129,533	(37.12)	80,737	(23.14)	34,941	(10.01)	.2730	.1824	.5446	2.351
21. Gifu													
1. Inaba (伊奈波)	11,766	3,112	(26.45)	4,932	(41.92)	2,405	(20.44)	1,317	(11.19)	.3148	.1729	.5123	1.771
2. Ena (恵那)	5,921	1,675	(28.29)	2,450	(41.38)	1,219	(20.59)	577	(9.74)	.3012	.1655	.5333	0.508
3. Gujo (郡上)	702	191	(27.21)	261	(37.18)	174	(24.79)	76	(10.83)	.2792	.1978	.5230	0.052
4. Hajima (羽島)	15,866	3,981	(25.09)	6,529	(41.15)	3,288	(20.72)	2,068	(13.03)	.3215	.1852	.4933	30.373
Total	34,255	8,959	(26.15)	14,172	(41.37)	7,086	(20.69)	4,038	(11.79)	.3148	.1778	.5074	19.156
continued													

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
22. Shizuoka													
1. Shuzenji (修善寺)	441	128	(29.02)	157	(35.60)	97	(22.00)	59	(13.38)	.2828	.1941	.5230	3.926
2. Shimoda (下田)	1,304	392	(30.06)	510	(39.11)	289	(22.16)	113	(8.67)	.2782	.1688	.5530	1.230
3. Fuji (富士)	4,995	1,458	(29.19)	1,900	(38.04)	1,108	(22.18)	529	(10.59)	.2828	.1798	.5375	1.507
4. Shimada (島田)	3,678	1,047	(28.47)	1,255	(34.12)	994	(27.03)	382	(10.39)	.2554	.2091	.5355	0.514
5. Tenryu (天竜)	953	239	(25.08)	346	(36.31)	258	(27.07)	110	(11.54)	.2785	.2170	.5044	0.420
6. Hamamatsu (浜松)	562	157	(27.94)	215	(38.26)	131	(23.31)	59	(10.50)	.2843	.1865	.5292	0.010
Total	11,933	3,421	(28.67)	4,383	(36.73)	2,877	(24.11)	1,252	(10.49)	.2736	.1914	.5350	0.017
23. Aichi													
1. Shitara (設楽)	2,840	895	(31.51)	1,000	(35.21)	689	(24.26)	256	(9.01)	.2535	.1834	.5632	0.396
2. Shinshiro (新城)	8,894	2,588	(29.10)	3,342	(37.58)	2,100	(23.61)	864	(9.71)	.2744	.1837	.5418	2.045
3. Ichinomiya (一宮)	4,978	1,389	(27.90)	2,047	(41.12)	1,057	(21.23)	485	(9.74)	.2996	.1695	.5309	1.435
4. Toyokawa (豊川)	5,579	1,570	(28.14)	2,217	(39.74)	1,238	(22.19)	554	(9.93)	.2910	.1764	.5327	1.035
5. Toyohashi (豊橋)	12,877	3,430	(26.64)	5,096	(39.57)	2,940	(22.83)	1,411	(10.96)	.2968	.1864	.5168	0.230
6. Tahara (田原)	3,078	907	(29.47)	1,211	(39.34)	688	(22.35)	272	(8.84)	.2811	.1710	.5479	3.268
7. Asuke (足助)	2,552	667	(26.14)	1,104	(43.26)	534	(20.92)	247	(9.68)	.3152	.1676	.5172	3.367
8. Gamagori (蒲郡)	6,682	1,960	(29.33)	2,388	(35.74)	1,422	(21.28)	912	(13.65)	.2852	.1911	.5236	78.310
9. Okazaki (岡崎)	5,347	1,553	(29.04)	1,985	(37.12)	1,266	(23.68)	543	(10.16)	.2740	.1866	.5394	0.045
10. Toyota (豊田)	8,222	2,452	(29.82)	3,256	(39.60)	1,727	(21.00)	787	(9.57)	.2871	.1668	.5461	0.000
11. Anjo (安城)	7,687	2,176	(28.31)	2,853	(37.11)	1,757	(22.86)	901	(11.72)	.2836	.1904	.5260	10.349
12. Nishio (西尾)	5,910	1,740	(29.44)	2,244	(37.97)	1,327	(22.45)	599	(10.14)	.2795	.1789	.5417	0.193
13. Kariya (刈谷)	12,158	3,389	(27.87)	4,539	(37.33)	2,898	(23.84)	1,332	(10.96)	.2807	.1924	.5269	0.475
14. Handa (半田)	10,246	3,180	(31.04)	3,832	(37.40)	2,215	(21.62)	1,019	(9.95)	.2738	.1724	.5538	4.615
15. Mihama (美浜)	2,274	640	(28.14)	866	(38.08)	511	(22.47)	257	(11.30)	.2878	.1857	.5265	1.368
16. Seto (瀬戸)	5,515	1,567	(28.41)	2,198	(39.85)	1,233	(22.36)	517	(9.37)	.2883	.1743	.5374	4.251
													continued

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
17. Kasugai (春日井)	4,606	1,285	(27.90)	1,854	(40.25)	1,014	(22.01)	453	(9.83)	.2941	.1748	.5311	1.535
18. Nagoya* (名古屋)	11,339	3,180	(28.04)	4,488	(39.58)	2,471	(21.79)	1,200	(10.58)	.2939	.1775	.5286	0.412
19. Chita (知多)	4,145	1,212	(29.24)	1,578	(38.07)	922	(22.24)	433	(10.45)	.2821	.1793	.5386	0.753
20. Konan (江南)	7,115	2,100	(29.52)	2,800	(39.35)	1,491	(20.96)	724	(10.18)	.2891	.1699	.5410	1.517
21. Nishibiwajima (西枇杷島)	5,324	1,514	(28.44)	2,289	(42.99)	1,025	(19.25)	496	(9.32)	.3098	.1550	.5352	0.796
22. Inazawa (稲沢)	2,509	714	(28.46)	1,002	(39.94)	540	(21.52)	253	(10.08)	.2931	.1730	.5339	0.015
23. Bisai (尾西)	2,153	650	(30.19)	847	(39.34)	424	(19.69)	232	(10.78)	.2923	.1654	.5423	4.570
24. Tsushima (津島)	6,116	1,763	(28.83)	2,372	(38.78)	1,360	(22.24)	621	(10.15)	.2854	.1777	.5368	0.001
Total	148,146	42,521	(28.70)	57,408	(38.75)	32,849	(22.17)	15,368	(10.37)	.2866	.1786	.5347	4.682
*Total of samples from two or more health centers.													
24. Mie													
1. Suzuka (鈴鹿)	569	174	(30.58)	206	(36.20)	129	(22.67)	60	(10.54)	.2694	.1822	.5483	0.506
2. Tsu (津)	7,801	2,313	(29.65)	3,064	(39.28)	1,701	(21.80)	723	(9.27)	.2831	.1700	.5469	1.765
Total	8,370	2,487	(29.71)	3,270	(39.07)	1,830	(21.86)	783	(9.35)	.2822	.1709	.5470	1.209
25. Shiga													
1. Kinomoto (木之本)	282	80	(28.37)	123	(43.62)	53	(18.79)	26	(9.22)	.3136	.1518	.5346	0.046
2. Nagahama (長浜)	112	29	(25.89)	47	(41.96)	28	(25.00)	8	(7.14)	.2907	.1787	.5304	2.010
3. Hikone (彦根)	340	93	(27.35)	146	(42.94)	69	(20.29)	32	(9.41)	.3106	.1620	.5273	0.252
4. Yokaichi (八日市)	242	63	(26.03)	92	(38.02)	59	(24.38)	28	(11.57)	.2900	.1997	.5103	0.000
5. Minakuchi (水口)	837	242	(28.91)	310	(37.04)	219	(26.16)	66	(7.89)	.2600	.1895	.5505	5.571
6. Hachiman (八幡)	191	51	(26.70)	70	(36.65)	41	(21.47)	29	(15.18)	.3019	.2013	.4966	2.512
7. Kusatsu (草津)	244	72	(29.51)	100	(40.98)	50	(20.49)	22	(9.02)	.2934	.1607	.5459	0.075
8. Imazu (今津)	42	18	(42.86)	17	(40.48)	5	(11.90)	2	(4.76)	.2598	.0871	.6532	0.008
9. Katata (堅田)	24	11	(45.83)	7	(29.17)	4	(16.67)	2	(8.33)	.2073	.1326	.6600	0.500
10. Otsu (大津)	152	43	(28.29)	62	(40.79)	36	(23.68)	11	(7.24)	.2819	.1706	.5474	1.534

continued

Fig. 11. Kinki District (Prefectures 18 and 24-30).

Fig. 12. A part of Kinki District (Osaka and its neighborhood).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
Total	2,466	702	(28.47)	974	(39.50)	564	(22.87)	226	(9.16)	.2848	.1765	.5386	3.144
26. Kyoto													
1. Maizuru (舞鶴)	5,400	1,560	(28.89)	2,111	(39.09)	1,125	(20.83)	604	(11.19)	.2937	.1748	.5315	7.526
2. Amino (網野)	70	18	(25.71)	29	(41.43)	17	(24.29)	6	(8.57)	.2957	.1823	.5218	0.564
3. Yamashina (山科)	1,671	493	(29.50)	673	(40.28)	349	(20.89)	156	(9.34)	.2904	.1648	.5447	0.169
4. Higashiyama (東山)	2,208	639	(28.94)	839	(38.00)	508	(23.01)	222	(10.05)	.2794	.1819	.5387	0.046
5. Fushimi (伏見)	419	115	(27.45)	169	(40.33)	90	(21.48)	45	(10.74)	.3004	.1766	.5230	0.012
6. Nakakyo (中京)	1,410	379	(26.88)	587	(41.63)	302	(21.42)	142	(10.07)	.3057	.1727	.5217	0.548
7. Shimokyo (下京)	1,496	433	(28.94)	603	(40.31)	314	(20.99)	146	(9.76)	.2935	.1679	.5386	0.024
Total	12,674	3,637	(28.70)	5,011	(39.54)	2,705	(21.34)	1,321	(10.42)	.2923	.1738	.5339	1.499
27. Osaka													
1. Hirakata (枚方)	29,951	8,584	(28.66)	11,903	(39.74)	6,458	(21.56)	3,006	(10.04)	.2914	.1730	.5356	0.099
2. Takatsuki (高槻)	30,896	8,819	(28.54)	12,214	(39.53)	6,780	(21.94)	3,083	(9.98)	.2896	.1750	.5353	1.348
3. Ibaragi (茨木)	29,715	8,579	(28.87)	11,895	(40.03)	6,355	(21.39)	2,886	(9.71)	.2913	.1701	.5386	1.981
4. Neyagawa (寝屋川)	17,940	5,185	(28.90)	7,063	(39.37)	3,932	(21.92)	1,760	(9.81)	.2873	.1739	.5388	1.004
5. Shionawate (四条畷)	35,918	10,404	(28.97)	14,430	(40.17)	7,508	(20.90)	3,576	(9.96)	.2937	.1684	.5378	0.222
6. Moriguchi (守口)	37,771	10,717	(28.37)	14,884	(39.41)	8,337	(22.07)	3,833	(10.15)	.2899	.1768	.5333	0.650
7. Kadoma (門真)	1,977	579	(29.29)	770	(38.95)	429	(21.70)	199	(10.07)	.2858	.1739	.5403	0.055
8. Hiraoka (枚岡)	33,937	9,682	(28.53)	13,328	(39.27)	7,495	(22.09)	3,432	(10.11)	.2887	.1766	.5347	0.415
9. Fuse (布施)	35,841	10,390	(28.99)	14,148	(39.47)	7,697	(21.48)	3,606	(10.06)	.2895	.1725	.5380	0.309
10. Yao (八尾)	36,283	10,289	(28.36)	14,298	(39.41)	7,945	(21.90)	3,751	(10.34)	.2910	.1768	.5322	0.145
11. Fujiidera (藤井寺)	42,701	12,706	(29.76)	16,521	(38.69)	9,308	(21.80)	4,166	(9.76)	.2820	.1727	.5454	0.026

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
12. Tondabayashi (富田林)	23,563	6,997	(29.69)	9,056	(38.43)	5,130	(21.77)	2,380	(10.10)	.2823	.1744	.5433	2.580
13. Sayama (狭山)	8,751	2,612	(29.85)	3,468	(39.63)	1,860	(21.25)	811	(9.27)	.2854	.1666	.5479	0.931
14. Suita (吹田)	27,867	8,080	(28.99)	11,007	(39.50)	6,064	(21.76)	2,716	(9.75)	.2878	.1725	.5397	1.621
15. Ikeda (池田)	25,348	7,315	(28.86)	9,975	(39.35)	5,603	(22.10)	2,455	(9.69)	.2865	.1743	.5392	3.975
16. Toyonaka (豊中)	41,380	11,826	(28.58)	16,381	(39.59)	8,992	(21.73)	4,181	(10.10)	.2908	.1744	.5348	0.100
17. Asahi-ku (大阪市旭区)	6,340	1,804	(28.45)	2,523	(39.79)	1,388	(21.89)	625	(9.86)	.2908	.1741	.5352	0.751
18. Joto-ku (城東区)	2,771	745	(26.89)	1,178	(42.51)	579	(20.89)	269	(9.71)	.3097	.1674	.5229	2.047
19. Higashinari-ku (東成区)	7,121	2,064	(28.98)	2,712	(38.08)	1,654	(23.23)	691	(9.70)	.2779	.1813	.5408	1.670
20. Ikuno-ku (生野区)	1,576	450	(28.55)	587	(37.25)	380	(24.11)	159	(10.09)	.2746	.1891	.5363	0.227
21. Higashi-ku (東区)	563	144	(25.58)	222	(39.43)	131	(23.27)	66	(11.72)	.3010	.1937	.5053	0.003
22. Minami-ku (南区)	1,166	291	(24.96)	471	(40.39)	286	(24.53)	118	(10.12)	.2984	.1928	.5088	3.469
23. Bandai (万代診療所)	15,657	4,455	(28.45)	6,289	(40.17)	3,352	(21.41)	1,561	(9.97)	.2940	.1717	.5343	0.433
24. Kita-ku (北区)	1,728	465	(26.91)	715	(41.38)	371	(21.47)	177	(10.24)	.3049	.1739	.5212	0.376
25. Nishi-ku (西区)	3,924	1,079	(27.50)	1,625	(41.41)	806	(20.54)	414	(10.55)	.3067	.1698	.5235	0.119
26. Nishinari-ku (西成区)	6,364	1,768	(27.78)	2,429	(38.17)	1,477	(23.21)	690	(10.84)	.2858	.1878	.5264	0.116
27. Suminoe (住之江)	886	218	(24.60)	395	(44.58)	195	(22.01)	78	(8.80)	.3202	.1698	.5100	6.296
28. Nishiyodogawa-ku (西淀川区)	5,813	1,661	(28.57)	2,295	(39.48)	1,294	(22.26)	563	(9.69)	.2875	.1753	.5371	1.555
29. Izumiotsu (泉大津)	21,325	6,107	(28.64)	8,505	(39.88)	4,667	(21.89)	2,046	(9.59)	.2897	.1725	.5378	5.877
30. Izumi (和泉)	13,469	3,718	(27.60)	5,521	(40.99)	2,816	(20.91)	1,414	(10.50)	.3034	.1717	.5249	0.137
31. Kishiwada (岸和田)	20,588	6,039	(29.33)	7,955	(38.64)	4,485	(21.78)	2,109	(10.24)	.2847	.1754	.5399	2.321
32. Kaizuka (貝塚)	12,509	3,580	(28.62)	4,965	(39.69)	2,743	(21.93)	1,221	(9.76)	.2894	.1737	.5369	1.828

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
33. Izumisano (泉佐野)	10,696	3,059	(28.60)	4,068	(38.03)	2,453	(22.93)	1,116	(10.43)	.2820	.1837	.5343	0.096
34. Ozaki (尾崎)	12,770	3,713	(29.08)	4,751	(37.20)	2,995	(23.45)	1,311	(10.27)	.2752	.1858	.5390	0.031
Total	605,105	174,124	(28.78)	238,547	(39.42)	131,965	(21.81)	60,469	(9.99)	.2889	.1742	.5369	5.404
28. Hyogo													
1. Itami (伊丹)	24,883	7,007	(28.16)	10,055	(40.41)	5,359	(21.54)	2,462	(9.89)	.2954	.1721	.5325	3.189
2. Amagasaki-Kita (尼ヶ崎北)	420	89	(21.19)	171	(40.71)	101	(24.05)	59	(14.05)	.3273	.2131	.4596	0.006
3. Ibid.	522	155	(29.69)	205	(39.27)	114	(21.84)	48	(9.20)	.2826	.1698	.5475	0.150
4. Amagasaki-Higashi (尼ヶ崎東)	631	158	(25.04)	260	(41.20)	155	(24.56)	58	(9.19)	.2983	.1878	.5138	4.072
5. Takarazuka (宝塚)	23,442	6,566	(28.01)	9,466	(40.38)	4,990	(21.29)	2,420	(10.32)	.2979	.1730	.5291	0.011
6. Nishinomiya (西宮)	63,440	18,443	(29.07)	25,319	(39.91)	13,093	(20.64)	6,585	(10.38)	.2944	.1691	.5364	19.092
7. Ashiya (芦屋)	8,931	2,499	(27.98)	3,578	(40.06)	1,876	(21.01)	978	(10.95)	.2995	.1747	.5258	3.448
8. Sanda (三田)	6,150	1,626	(26.44)	2,579	(41.93)	1,343	(21.84)	602	(9.79)	.3063	.1738	.5199	7.467
9. Nada (灘)	1,547	418	(27.02)	670	(43.31)	294	(19.00)	165	(10.67)	.3211	.1611	.5177	0.260
10. Ikuta (生田)	1,832	498	(27.18)	722	(39.41)	427	(23.31)	185	(10.10)	.2902	.1844	.5254	1.091
11. Kobe-Kita (神戸北)	339	92	(27.14)	134	(39.53)	75	(22.12)	38	(11.21)	.2977	.1833	.5190	0.047
12. Hyogo (兵庫)	1,225	329	(26.86)	519	(42.37)	281	(22.94)	96	(7.84)	.2972	.1696	.5331	10.713
13. Nagata (長田)	2,144	576	(26.87)	781	(36.43)	550	(25.65)	237	(11.05)	.2756	.2046	.5198	0.166
14. Nishiwaki (西脇)	6,615	1,836	(27.76)	2,758	(41.69)	1,396	(21.10)	625	(9.45)	.3018	.1671	.5310	4.638
15. Yashiro (社)	11,182	3,229	(28.88)	4,381	(39.18)	2,437	(21.79)	1,135	(10.15)	.2881	.1750	.5369	0.087
16. Akashi (明石)	3,940	1,095	(27.79)	1,575	(39.97)	865	(21.95)	405	(10.28)	.2949	.1769	.5282	0.156
17. Kakogawa (加古川)	61,293	18,440	(30.09)	23,649	(38.58)	13,401	(21.86)	5,803	(9.47)	.2794	.1714	.5492	1.300
18. Fukuzaki (福岡)	16,572	5,006	(30.21)	6,387	(38.54)	3,640	(21.96)	1,539	(9.29)	.2780	.1710	.5510	1.409

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
19. Himeji-Nishi (姫路西)	3,233	920	(28.46)	1,239	(38.32)	750	(23.20)	324	(10.02)	.2816	.1830	.5353	0.444
20. Yamazaki (山崎)	2,447	719	(29.38)	937	(38.29)	534	(21.82)	257	(10.50)	.2839	.1770	.5391	0.843
21. Tatsuno (竜野)	37,833	10,993	(29.06)	14,568	(38.51)	8,530	(22.55)	3,742	(9.89)	.2818	.1781	.5400	1.449
22. Aioi (相生)	29,589	8,393	(28.37)	11,590	(39.17)	6,590	(22.27)	3,016	(10.19)	.2885	.1783	.5332	0.436
23. Sayo (佐用)	1,539	420	(27.29)	634	(41.20)	342	(22.22)	143	(9.29)	.2977	.1732	.5291	2.693
24. Ako (赤穂)	27,176	7,854	(28.90)	10,807	(39.77)	5,850	(21.53)	2,665	(9.81)	.2901	.1714	.5385	0.901
25. Toyooka (豊岡)	11,113	3,082	(27.73)	4,763	(42.86)	2,207	(19.86)	1,061	(9.55)	.3107	.1601	.5293	3.077
26. Kasumi (香住)	4,993	1,404	(28.12)	2,029	(40.64)	1,071	(21.45)	489	(9.79)	.2964	.1711	.5326	1.015
27. Hamasaka (浜坂)	2,355	623	(26.45)	934	(39.66)	562	(23.86)	236	(10.02)	.2918	.1877	.5205	3.267
28. Tsuna (津名)	4,350	1,280	(29.43)	1,750	(40.23)	867	(19.93)	453	(10.41)	.2967	.1650	.5384	2.948
29. Sumoto (洲本)	12,268	3,360	(27.39)	5,174	(42.17)	2,542	(20.72)	1,192	(9.72)	.3071	.1663	.5266	5.161
30. Mihara (三原)	3,873	1,045	(26.98)	1,686	(43.53)	739	(19.08)	403	(10.41)	.3211	.1602	.5187	0.089
Total	375,877	108,155	(28.77)	149,320	(39.73)	80,981	(21.54)	37,421	(9.96)	.2908	.1724	.5368	3.040
29. Nara													
1. Nara-city* (奈良市)	2,832	837	(29.56)	1,068	(37.71)	633	(22.35)	294	(10.38)	.2791	.1796	.5413	0.609
2-1. Soegami-gun* (添上郡)	12	6	(50.00)	3	(25.00)	2	(16.67)	1	(8.33)	.1812	.1323	.6863	0.430
2-2. Yamabe-gun* (山辺郡)	203	62	(30.54)	84	(41.38)	35	(17.24)	22	(10.84)	.3067	.1509	.5423	0.917
2-3. Uda-gun* (宇陀郡)	995	250	(25.13)	414	(41.61)	224	(22.51)	107	(10.75)	.3107	.1836	.5057	0.673
2-4. Sakurai-city* (桜井市)	827	260	(31.44)	298	(36.03)	182	(22.01)	87	(10.52)	.2678	.1778	.5543	1.411
2. Subtotal (North-East District)	2,037	578	(28.38)	799	(39.22)	443	(21.75)	217	(10.65)	.2917	.1776	.5308	0.291

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
3-1. Ikoma-city* (生駒市)	478	121	(25.31)	183	(38.28)	121	(25.31)	53	(11.09)	.2893	.2031	.5076	0.319
3-2. Ikoma-gun* (生駒郡)	602	160	(26.58)	240	(39.87)	151	(25.08)	51	(8.47)	.2838	.1866	.5295	4.463
3-3. Kitakatsuragi-gun* (北葛城郡)	1,556	474	(30.46)	564	(36.25)	372	(23.91)	146	(9.38)	.2629	.1834	.5536	0.186
3-4. Shiki-gun* (磯城郡)	624	205	(32.85)	231	(37.02)	129	(20.67)	59	(9.46)	.2676	.1636	.5687	0.560
3-5. Tenri-city* (天理市)	1,120	308	(27.50)	444	(39.64)	268	(23.93)	100	(8.93)	.2846	.1817	.5337	3.738
3-6. Yamato-Koriyama-city* (大和郡山市)	938	284	(30.28)	344	(36.67)	222	(23.67)	88	(9.38)	.2659	.1820	.5522	0.141
3-7. Yamato-Takada-city* (大和高田市)	1,011	289	(28.59)	406	(40.16)	224	(22.16)	92	(9.10)	.2886	.1715	.5399	1.113
3-8. Kashiwara-city* (橿原市)	1,433	444	(30.98)	538	(37.54)	304	(21.21)	147	(10.26)	.2766	.1716	.5517	1.452
3-9. Takaichi-gun* (高市郡)	277	84	(30.32)	107	(38.63)	59	(21.30)	27	(9.75)	.2812	.1695	.5493	0.022
3-10. Gose-city* (御所市)	579	201	(34.72)	219	(37.82)	101	(17.44)	58	(10.02)	.2757	.1472	.5771	4.120
3-11. Gojo-city* (五条市)	503	163	(32.41)	193	(38.37)	101	(20.08)	46	(9.15)	.2751	.1584	.5665	0.174
3. Subtotal (North-West District)	9,121	2,733	(29.96)	3,469	(38.03)	2,052	(22.50)	867	(9.51)	.2759	.1755	.5486	0.514
4-1. Shimokitayama* (下北山村)	39	10	(25.64)	19	(48.72)	9	(23.08)	1	(2.56)	.3102	.1414	.5477	3.060
4-2. Kamikitayama* (上北山村)	44	13	(29.55)	20	(45.45)	6	(13.64)	5	(11.36)	.3394	.1326	.5279	0.466
4-3. Kawakami* (川上村)	79	21	(26.58)	30	(37.97)	18	(22.78)	10	(12.66)	.2960	.1956	.5084	0.139

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
4-4. Higashiyoshino* (東吉野村)	55	16	(29.09)	22	(40.00)	11	(20.00)	6	(10.91)	.2982	.1682	.5336	0.072
4. Subtotal (Higashiyoshino)	217	60	(27.65)	91	(41.94)	44	(20.28)	22	(10.14)	.3078	.1659	.5263	0.002
5-1. Yoshino* (吉野町)	363	119	(32.78)	131	(36.09)	83	(22.87)	30	(8.26)	.2544	.1704	.5752	0.112
5-2. Oyodo* (大淀町)	644	196	(30.43)	245	(38.04)	143	(22.20)	60	(9.32)	.2747	.1726	.5527	0.031
5-3. Shimoichi* (下市町)	447	124	(27.74)	166	(37.14)	112	(25.06)	45	(10.07)	.2741	.1951	.5308	0.283
5-4. Kurotaki* (黒滝村)	98	27	(27.55)	33	(33.67)	23	(23.47)	15	(15.31)	.2817	.2145	.5036	1.449
5-5. Nishiyoshino* (西吉野村)	71	19	(26.76)	30	(42.25)	17	(23.94)	5	(7.04)	.2916	.1714	.5368	1.085
5-6. Tenkawa* (天川村)	41	12	(29.27)	14	(34.15)	14	(34.15)	1	(2.44)	.2089	.2089	.5815	3.135
5-7. Nosegawa* (野迫川村)	62	24	(38.71)	19	(30.65)	10	(16.13)	9	(14.52)	.2531	.1631	.5832	4.474
5-8. Oro* (大塔村)	34	10	(29.41)	16	(47.06)	7	(20.59)	1	(2.94)	.2986	.1280	.5730	1.676
5-9. Totsukawa* (十津川村)	57	22	(38.60)	17	(29.82)	9	(15.79)	9	(15.79)	.2551	.1679	.5762	5.281
5. Subtotal (Nishiyoshino)	1,817	553	(30.43)	671	(36.93)	418	(23.00)	175	(9.63)	.2690	.1793	.5518	0.000
Grand total	16,024	4,761	(29.71)	6,098	(38.06)	3,590	(22.40)	1,575	(9.83)	.2783	.1769	.5448	0.000
*Administrative division.													
30. Wakayama													
1. Chuoh (中央)	13,106	3,793	(28.94)	5,050	(38.53)	2,964	(22.62)	1,299	(9.91)	.2822	.1787	.5391	0.671
2. Nishi (西)	5,679	1,679	(29.57)	2,124	(37.40)	1,338	(23.56)	538	(9.47)	.2716	.1820	.5464	1.642
3. Shingu (新宮)	6,301	2,046	(32.47)	2,382	(37.80)	1,353	(21.47)	520	(8.25)	.2659	.1619	.5721	1.546
4. Koza (古座)	1,530	460	(30.07)	579	(37.84)	367	(23.99)	124	(8.10)	.2662	.1769	.5568	4.705
Total	26,616	7,978	(29.97)	10,135	(38.08)	6,022	(22.63)	2,481	(9.32)	.2752	.1753	.5495	4.852

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
31. Tottori													
1. Kurayoshi (倉吉)	2,137	565	(26.44)	891	(41.69)	447	(20.92)	234	(10.95)	.3117	.1745	.5137	0.016
2. Yonago (米子)	4,748	1,225	(25.80)	2,066	(43.51)	980	(20.64)	477	(10.05)	.3195	.1680	.5125	3.703
Subtotal	6,885	1,790	(26.00)	2,957	(42.95)	1,427	(20.73)	711	(10.33)	.3171	.1700	.5129	2.329
Red Cross Blood Center	92,486	26,799	(28.98)	37,401	(40.44)	18,724	(20.25)	9,562	(10.34)	.2979	.1665	.5356	26.734
Grand total	99,371	28,589	(28.77)	40,358	(40.61)	20,151	(20.28)	10,273	(10.34)	.2992	.1668	.5340	21.817
32. Shimane													
1. Kawamoto (川本)	2,527	760	(30.08)	978	(38.70)	541	(21.41)	248	(9.81)	.2823	.1705	.5472	0.153
2. Masuda (益田)	1,657	496	(29.93)	631	(38.08)	366	(22.09)	164	(9.90)	.2786	.1752	.5462	0.053
Total	4,184	1,256	(30.02)	1,609	(38.46)	907	(21.68)	412	(9.85)	.2808	.1724	.5468	0.200
33. Okayama													
1. Shoo (勝央)	770	175	(22.73)	332	(43.12)	172	(22.34)	91	(11.82)	.3297	.1891	.4812	0.486
2. Mimasaka (美作)	1,124	290	(25.80)	461	(41.01)	254	(22.60)	119	(10.59)	.3051	.1831	.5118	0.606
3. Bizen (備前)	1,002	286	(28.54)	393	(39.22)	231	(23.05)	92	(9.18)	.2827	.1774	.5398	1.237
4. Tsuyama (津山)	379	78	(20.58)	162	(42.74)	97	(25.59)	42	(11.08)	.3239	.2064	.4695	2.843
5. Seto (瀬戸)	442	107	(24.21)	173	(39.14)	108	(24.43)	54	(12.22)	.3028	.2042	.4930	0.014
6. Saidaiji (西大寺)	995	287	(28.84)	409	(41.11)	207	(20.80)	92	(9.25)	.2960	.1640	.5401	0.368
7. Fukuwatari (福渡)	319	86	(26.96)	138	(43.26)	59	(18.50)	36	(11.29)	.3247	.1615	.5139	0.343
8. Okayama (岡山)	902	245	(27.16)	376	(41.69)	207	(22.95)	74	(8.20)	.2945	.1717	.5338	5.649
9. Tamano (玉野)	931	221	(23.74)	399	(42.86)	211	(22.66)	100	(10.74)	.3204	.1849	.4947	1.752
10. Katsuyama (勝山)	1,359	345	(25.39)	602	(44.30)	271	(19.94)	141	(10.38)	.3274	.1656	.5070	0.490
11. Soja (総社)	514	135	(26.26)	208	(40.47)	103	(20.04)	68	(13.23)	.3171	.1817	.5011	2.282
12. Kurashiki-Minami (倉敷南)	353	82	(23.23)	159	(45.05)	74	(20.96)	38	(10.76)	.3367	.1745	.4887	0.542

continued

Fig. 13. Chugoku and Shikoku Districts (Prefectures 31-39).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
13. Kurashiki-Higashi (倉敷東)	1,567	348	(22.21)	628	(40.08)	411	(26.23)	180	(11.49)	.3062	.2123	.4815	5.104
14. Kurashiki-Nishi (倉敷西)	1,523	389	(25.54)	589	(38.67)	367	(24.10)	178	(11.69)	.2955	.1987	.5058	0.007
15. Takahashi (高梁)	1,395	359	(25.73)	547	(39.21)	333	(23.87)	156	(11.18)	.2961	.1944	.5095	0.233
16. Niimi (新見)	1,170	331	(28.29)	491	(41.97)	225	(19.23)	123	(10.51)	.3100	.1615	.5286	0.510
17. Nariwa (成羽)	239	54	(22.59)	97	(40.59)	54	(22.59)	34	(14.23)	.3264	.2043	.4693	0.262
18. Kasaoka (笠岡)	1,243	299	(24.05)	527	(42.40)	271	(21.80)	146	(11.75)	.3231	.1850	.4919	0.083
Total	16,227	4,117	(25.37)	6,691	(41.23)	3,655	(22.52)	1,764	(10.87)	.3088	.1845	.5067	6.474
34. Hiroshima													
1. Saijo (西城)	723	206	(28.49)	327	(45.23)	132	(18.26)	58	(8.02)	.3176	.1420	.5404	1.376
2. Onomichi (尾道)	1,064	276	(25.94)	452	(42.48)	220	(20.68)	116	(10.90)	.3173	.1729	.5098	0.008
3. Mihara (三原)	1,747	523	(29.94)	694	(39.73)	344	(19.69)	186	(10.65)	.2943	.1647	.5409	2.744
4. Shobara (庄原)	1,217	361	(29.66)	504	(41.41)	239	(19.64)	113	(9.29)	.2979	.1570	.5451	0.010
5. Chiyoda (千代田)	1,833	477	(26.02)	749	(40.86)	399	(21.77)	208	(11.35)	.3085	.1821	.5094	0.036
6. Umda (海田)	1,465	403	(27.51)	588	(40.14)	341	(23.28)	133	(9.08)	.2889	.1785	.5326	3.741
7. Kure-Nishi (呉西)	1,166	334	(28.64)	433	(37.14)	276	(23.67)	123	(10.55)	.2766	.1889	.5345	0.020
8. Kure-Higashi (呉東)	747	199	(26.64)	273	(36.55)	182	(24.36)	93	(12.45)	.2848	.2044	.5108	0.730
9. Hiroshima* (広島衛生試)	2,166	550	(25.39)	916	(42.29)	484	(22.35)	216	(9.97)	.3106	.1782	.5112	4.181
10. Kakei (加計)	801	248	(30.96)	303	(37.83)	172	(21.47)	78	(9.74)	.2755	.1704	.5542	0.175
Total	12,929	3,577	(27.67)	5,239	(40.52)	2,789	(21.57)	1,324	(10.24)	.2987	.1745	.5268	0.621
*Hiroshima Health Laboratory													
35. Yamaguchi													
1. Iwakuni (岩国)	1,066	292	(27.39)	435	(40.81)	228	(21.39)	111	(10.41)	.3017	.1743	.5240	0.018

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
2. Tokuyama (徳山)	5,369	1,478	(27.53)	2,162	(40.27)	1,158	(21.57)	571	(10.64)	.2992	.1766	.5242	0.042
3. Nagato (長門)	711	183	(25.74)	290	(40.79)	170	(23.91)	68	(9.56)	.2973	.1856	.5171	2.463
4. Toyota (豊田)	746	256	(34.32)	270	(36.19)	120	(16.09)	100	(13.40)	.2848	.1574	.5575	26.207
5. Toyoura (豊浦)	1,979	493	(24.91)	877	(44.32)	415	(20.97)	194	(9.80)	.3243	.1688	.5068	4.284
6. Shimonoseki (下関)	1,634	456	(27.91)	662	(40.51)	358	(21.91)	158	(9.67)	.2949	.1732	.5319	0.826
Total	11,505	3,158	(27.45)	4,696	(40.82)	2,449	(21.29)	1,202	(10.45)	.3021	.1739	.5240	0.045
36. Tokushima													
1. Naruto (鳴門)	2,252	599	(26.60)	925	(41.07)	489	(21.71)	239	(10.61)	.3052	.1775	.5172	0.185
2. Tokushima (徳島)	5,650	1,539	(27.24)	2,323	(41.12)	1,177	(20.83)	611	(10.81)	.3064	.1731	.5205	0.402
3. Komatsushima (小松島)	1,486	414	(27.86)	612	(41.18)	301	(20.26)	159	(10.70)	.3058	.1688	.5254	0.349
4. Anan (阿南)	2,945	797	(27.06)	1,221	(41.46)	627	(21.29)	300	(10.19)	.3051	.1725	.5224	0.553
5. Hiwasa (日和佐)	803	231	(28.77)	338	(42.09)	147	(18.31)	87	(10.83)	.3126	.1576	.5299	1.355
6. Ishii (石井)	682	188	(27.57)	284	(41.64)	147	(21.55)	63	(9.24)	.3003	.1687	.5309	0.938
7. Kamojima (鴨島)	2,159	607	(28.11)	874	(40.48)	464	(21.49)	214	(9.91)	.2960	.1720	.5320	0.265
8. Anabuki (穴吹)	1,026	286	(27.88)	425	(41.42)	207	(20.18)	108	(10.53)	.3065	.1673	.5262	0.125
9. Ikeda (池田)	602	160	(26.58)	238	(39.53)	135	(22.43)	69	(11.46)	.2996	.1867	.5137	0.072
Total	17,605	4,821	(27.38)	7,240	(41.12)	3,694	(20.98)	1,850	(10.51)	.3045	.1723	.5232	0.007
37. Kagawa													
1. Tonosho (土庄)	168	49	(29.17)	80	(47.62)	28	(16.67)	11	(6.55)	.3251	.1245	.5503	0.856
2. Sakaide (坂出)	490	130	(26.53)	186	(37.96)	120	(24.49)	54	(11.02)	.2860	.1972	.5168	0.051
3. Marugame (丸亀)	5,881	1,547	(26.31)	2,471	(42.02)	1,248	(21.22)	615	(10.46)	.3111	.1737	.5152	1.172
Subtotal	6,539	1,726	(26.40)	2,737	(41.86)	1,396	(21.35)	680	(10.40)	.3096	.1742	.5162	1.557

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
Red Cross Blood Center	22,619	6,294	(27.83)	9,275	(41.01)	4,613	(20.39)	2,437	(10.77)	.3051	.1701	.5248	6.158
Grand total	29,158	8,020	(27.51)	12,012	(41.20)	6,009	(20.61)	3,117	(10.69)	.3061	.1710	.5230	2.439
38. Ehime													
1. Mishima (三島)	5,048	1,238	(24.52)	2,028	(40.17)	1,093	(21.65)	689	(13.65)	.3186	.1945	.4868	11.478
2. Niihama (新居浜)	2,217	641	(28.91)	897	(40.46)	441	(19.89)	238	(10.74)	.3005	.1666	.5330	1.985
3. Saijo (西条)	1,449	380	(26.22)	656	(45.27)	266	(18.36)	147	(10.14)	.3325	.1545	.5130	0.043
4. Nyugawa (壬生川)	2,701	781	(28.92)	1,120	(41.47)	490	(18.14)	310	(11.48)	.3120	.1600	.5279	10.266
5. Imabari (今治)	5,423	1,358	(25.04)	2,265	(41.77)	1,247	(22.99)	553	(10.20)	.3085	.1836	.5080	10.876
6. Kuma (久万)	3,609	532	(14.74)	1,584	(43.89)	840	(23.28)	653	(18.09)	.3831	.2341	.3828	0.104
7. Matsuyama (松山)	6,874	1,704	(24.79)	3,016	(43.88)	1,351	(19.65)	803	(11.68)	.3329	.1711	.4959	0.896
8. Iyo (伊予)	1,890	492	(26.03)	782	(41.38)	394	(20.85)	222	(11.75)	.3146	.1786	.5068	0.772
9. Nomura (野村)	3,650	797	(21.84)	1,688	(46.25)	770	(21.10)	395	(10.82)	.3470	.1760	.4769	10.957
10. Ozu (大洲)	324	76	(23.46)	123	(37.96)	70	(21.60)	55	(16.98)	.3239	.2131	.4628	4.296
11. Yawatahama (八幡浜)	4,760	1,450	(30.46)	1,873	(39.35)	990	(20.80)	447	(9.39)	.2840	.1644	.5516	0.023
12. Uwa (宇和)	2,013	505	(25.09)	861	(42.77)	440	(21.86)	207	(10.28)	.3161	.1769	.5069	2.632
13. Uwajima (宇和島)	9,698	2,619	(27.01)	4,290	(44.24)	1,811	(18.67)	978	(10.08)	.3242	.1560	.5199	0.013
14. Misho (御庄)	5,200	1,423	(27.37)	2,402	(46.19)	1,036	(19.92)	339	(6.52)	.3158	.1439	.5402	66.066
Total	54,856	13,996	(25.51)	23,585	(42.99)	11,239	(20.49)	6,036	(11.00)	.3224	.1727	.5049	0.771
39. Kochi													
1. Chuo (中央)	4,689	1,192	(25.42)	2,052	(43.76)	923	(19.68)	522	(11.13)	.3283	.1682	.5036	0.064
2. Kubokawa (窪川)	4,571	1,174	(25.68)	1,998	(43.71)	912	(19.95)	487	(10.65)	.3247	.1671	.5081	0.300
Subtotal	9,260	2,366	(25.55)	4,050	(43.74)	1,835	(19.82)	1,009	(10.90)	.3265	.1676	.5058	0.041

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
Red Cross Blood Center	69,559	19,058	(27.40)	28,236	(40.59)	14,624	(21.02)	7,641	(10.98)	.3037	.1751	.5212	12.637
Grand total	78,819	21,424	(27.18)	32,286	(40.96)	16,459	(20.88)	8,650	(10.97)	.3063	.1743	.5194	11.337
40. Fukuoka													
1. Tobata (戸畑)	2,388	612	(25.63)	998	(41.79)	538	(22.53)	240	(10.05)	.3074	.1797	.5129	3.815
2. Wakamatsu (若松)	1,797	450	(25.04)	830	(46.19)	343	(19.09)	174	(9.68)	.3370	.1566	.5063	2.350
3. Tagawa (田川)	3,459	994	(28.74)	1,425	(41.20)	729	(21.08)	311	(8.99)	.2951	.1642	.5407	3.001
4. Soeda (添田)	1,012	295	(29.15)	438	(43.28)	189	(18.68)	90	(8.89)	.3089	.1491	.5420	0.191
5. Ukiha (浮羽)	1,559	475	(30.47)	661	(42.40)	276	(17.70)	147	(9.43)	.3053	.1461	.5487	0.766
6. Onga (遠賀)	8,696	2,767	(31.82)	2,920	(33.58)	2,002	(23.02)	1,007	(11.58)	.2575	.1899	.5525	47.148
7. Munakata (宗像)	7,329	2,040	(27.83)	2,808	(38.31)	1,631	(22.25)	850	(11.60)	.2913	.1861	.5226	6.664
8. Kasuya (粕屋)	4,431	1,232	(27.80)	1,789	(40.37)	967	(21.82)	443	(10.00)	.2960	.1745	.5295	0.825
9. Fukuoka-Minami (福岡南)	3,203	817	(25.51)	1,379	(43.05)	725	(22.64)	282	(8.80)	.3087	.1734	.5178	19.322
10. Yame (八女)	2,551	664	(26.03)	1,092	(42.81)	538	(21.09)	257	(10.07)	.3145	.1708	.5147	1.890
Total	36,425	10,346	(28.40)	14,340	(39.37)	7,938	(21.79)	3,801	(10.44)	.2917	.1767	.5315	1.226
41. Saga													
1. Tosu (鳥栖)	3,734	960	(25.71)	1,505	(40.31)	868	(23.25)	401	(10.74)	.3011	.1880	.5109	1.972
2. Kanzaki (神崎)	3,469	998	(28.77)	1,344	(38.74)	748	(21.56)	379	(10.93)	.2898	.1779	.5323	2.177
3. Saga (佐賀)	14,225	4,002	(28.13)	5,728	(40.27)	3,071	(21.59)	1,424	(10.01)	.2951	.1731	.5318	1.025
4. Ogi (小城)	4,688	1,354	(28.88)	1,856	(39.59)	950	(20.26)	528	(11.26)	.2976	.1718	.5306	8.437
5. Kashima (鹿島)	4,357	1,196	(27.45)	1,845	(42.35)	874	(20.06)	442	(10.14)	.3108	.1646	.5245	0.060
6. Takeo (武雄)	7,822	2,141	(27.37)	3,281	(41.95)	1,588	(20.30)	812	(10.38)	.3095	.1674	.5231	0.004
7. Karatsu (唐津)	6,834	1,886	(27.60)	2,830	(41.41)	1,412	(20.66)	706	(10.33)	.3053	.1693	.5254	0.001
8. Imari (伊万里)	5,115	1,423	(27.82)	2,004	(39.18)	1,169	(22.85)	519	(10.15)	.2886	.1817	.5297	0.983
Total	50,244	13,960	(27.78)	20,393	(40.59)	10,680	(21.26)	5,211	(10.37)	.2998	.1732	.5271	0.004

continued

Fig. 14. Kyushu District (Prefectures 40-46).

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
42. Nagasaki													
1. Obama (小浜)	8,000	2,088	(26.10)	3,373	(42.16)	1,730	(21.63)	809	(10.11)	.3101	.1743	.5155	6.402
2. Omura (大村)	6,567	1,587	(24.17)	2,792	(42.52)	1,426	(21.71)	762	(11.60)	.3230	.1836	.4933	0.677
3. Kita (北)	8,831	2,359	(26.71)	3,534	(40.02)	1,993	(22.57)	945	(10.70)	.2983	.1833	.5184	0.778
4. Yoshii (吉井)	5,790	1,666	(28.77)	2,258	(39.00)	1,263	(21.81)	603	(10.41)	.2885	.1766	.5349	0.495
5. Arikawa (有川)	1,304	334	(25.61)	523	(40.11)	310	(23.77)	137	(10.51)	.2983	.1900	.5116	1.409
Total	30,492	8,034	(26.35)	12,480	(40.93)	6,722	(22.05)	3,256	(10.68)	.3049	.1800	.5151	4.194
43. Kumamoto													
1. Kikuchi (菊池)	4,389	1,224	(27.89)	1,839	(41.90)	861	(19.62)	465	(10.59)	.3102	.1643	.5255	1.187
2. Uto (宇土)	9,623	2,794	(29.03)	3,834	(39.84)	2,009	(20.88)	986	(10.25)	.2932	.1699	.5370	1.346
3. Tamana (玉名)	1,565	398	(25.43)	690	(44.09)	313	(20.00)	164	(10.48)	.3265	.1665	.5069	0.401
4. Arao (荒尾)	1,858	553	(29.76)	749	(40.31)	360	(19.38)	196	(10.55)	.2979	.1623	.5398	2.513
Total	17,435	4,969	(28.50)	7,112	(40.79)	3,543	(20.32)	1,811	(10.39)	.3010	.1674	.5317	2.975
44. Oita													
1. Usuki (臼杵)	643	180	(27.99)	303	(47.12)	99	(15.40)	61	(9.49)	.3407	.1331	.5263	0.220
2. Sacki (佐伯)	1,752	550	(31.39)	689	(39.33)	361	(20.61)	152	(8.68)	.2791	.1592	.5617	0.146
3. Takada (高田)	1,593	450	(28.25)	620	(38.92)	354	(22.22)	169	(10.61)	.2894	.1803	.5303	0.080
4. Usa (宇佐)	3,501	838	(23.94)	1,487	(42.47)	841	(24.02)	335	(9.57)	.3103	.1868	.5029	22.425
5. Mie (三重)	15,546	4,330	(27.85)	6,204	(39.91)	3,397	(21.85)	1,615	(10.39)	.2951	.1769	.5281	0.061
Subtotal	23,035	6,348	(27.56)	9,303	(40.39)	5,052	(21.93)	2,332	(10.12)	.2970	.1760	.5269	4.054
Prefectural Health Depart.	40,253	11,971	(29.74)	15,844	(39.36)	8,520	(21.17)	3,918	(9.73)	.2864	.1687	.5449	0.247
Grand total	63,288	18,319	(28.95)	25,147	(39.73)	13,572	(21.44)	6,250	(9.88)	.2902	.1713	.5385	0.510
45. Miyazaki													
1. Nobeoka (延岡)	5,986	1,685	(28.15)	2,368	(39.56)	1,319	(22.03)	614	(10.26)	.2917	.1772	.5311	0.066
2. Hyuga (日向)	3,118	781	(25.05)	1,246	(39.96)	742	(23.80)	349	(11.19)	.3018	.1942	.5040	1.322
continued													

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
3. Takanabe (高鍋)	1,844	501	(27.17)	816	(44.25)	374	(20.28)	153	(8.30)	.3131	.1559	.5310	7.083
4. Saito (西都)	3,727	1,028	(27.58)	1,617	(43.39)	721	(19.35)	361	(9.69)	.3153	.1578	.5269	0.448
5. Kunitomi (国富)	2,886	836	(28.97)	1,186	(41.09)	608	(21.07)	256	(8.87)	.2936	.1635	.5430	2.706
6. Miyazaki (宮崎)	5,765	1,456	(25.26)	2,565	(44.49)	1,143	(19.83)	601	(10.42)	.3292	.1652	.5056	1.936
7. Nichinan (日南)	2,733	789	(28.87)	1,138	(41.64)	553	(20.23)	253	(9.26)	.2997	.1606	.5397	0.655
8. Kushima (串間)	2,804	843	(30.06)	1,133	(40.41)	540	(19.26)	288	(10.27)	.2967	.1600	.5433	2.985
9. Takachiho (高千穂)	3,271	910	(27.82)	1,442	(44.08)	598	(18.28)	321	(9.81)	.3209	.1520	.5271	0.019
10. Kobayashi (小林)	3,574	939	(26.27)	1,467	(41.05)	744	(20.82)	424	(11.86)	.3129	.1790	.5081	2.478
11. Miyakonojo (都城)	6,451	1,746	(27.07)	2,683	(41.59)	1,341	(20.79)	681	(10.56)	.3083	.1714	.5203	0.001
Total	42,159	11,514	(27.31)	17,661	(41.89)	8,683	(20.60)	4,301	(10.20)	.3082	.1683	.5235	1.909
46. Kagoshima													
1. Okuchi-city* (大口市)	9,211	2,414	(26.21)	3,805	(41.31)	2,015	(21.88)	977	(10.61)	.3071	.1786	.5143	1.930
2. Kokubu-city* (国分市)	8,533	2,126	(24.92)	3,377	(39.58)	2,006	(23.51)	1,024	(12.00)	.3041	.1969	.4990	0.007
3. Tarumi-city* (垂水市)	4,566	1,390	(30.44)	1,823	(39.93)	901	(19.73)	452	(9.90)	.2910	.1608	.5482	2.400
4. Kanoya-city* (鹿屋市)	15,804	4,557	(28.83)	6,270	(39.67)	3,337	(21.11)	1,640	(10.38)	.2929	.1721	.5350	2.356
5. Kagoshima-city* (鹿児島市)	141,933	40,731	(28.70)	57,386	(40.43)	29,020	(20.45)	14,796	(10.42)	.2985	.1683	.5332	34.502
6. Ibusuki-city* (指宿市)	8,338	2,143	(25.70)	3,727	(44.70)	1,626	(19.50)	842	(10.10)	.3284	.1613	.5103	3.452
7. Izumi-city* (出水市)	4,380	1,274	(29.09)	1,759	(40.16)	915	(20.89)	432	(9.86)	.2930	.1678	.5391	0.006
8. Akune-city* (阿久根市)	9,766	2,463	(25.22)	4,225	(43.26)	2,029	(20.78)	1,049	(10.74)	.3224	.1728	.5049	2.478
9. Sendai-city* (川内市)	19,276	5,186	(26.90)	8,018	(41.60)	4,118	(21.36)	1,954	(10.14)	.3058	.1727	.5215	5.746

continued

Health center or district	N	O		A		B		AB		p	q	r	χ^2
		No.	(%)	No.	(%)	No.	(%)	No.	(%)				
10. Kushikino-city* (串木野市)	11,031	3,317	(30.07)	4,641	(42.07)	2,085	(18.90)	988	(8.96)	.3003	.1507	.5490	0.185
11. Kaseda-city* (加世田市)	4,305	1,170	(27.18)	1,854	(43.07)	863	(20.05)	418	(9.71)	.3134	.1622	.5244	1.553
12. Makurazaki-city* (枕崎市)	14,275	4,096	(28.69)	6,330	(44.34)	2,542	(17.81)	1,307	(9.16)	.3182	.1454	.5363	0.271
13. Soo-gun* (曾於郡)	19,200	5,717	(29.78)	7,995	(41.64)	3,713	(19.34)	1,775	(9.24)	.2992	.1549	.5459	0.025
14. Kimotsuki-gun* (肝付郡)	20,986	5,635	(26.85)	8,662	(41.28)	4,288	(20.43)	2,401	(11.44)	.3116	.1742	.5143	11.717
15. Isa-gun* (伊佐郡)	2,572	697	(27.10)	1,089	(42.34)	485	(18.86)	301	(11.70)	.3206	.1659	.5135	4.794
16. Aira-gun* (始良郡)	27,433	7,706	(28.09)	11,896	(43.36)	5,171	(18.85)	2,660	(9.70)	.3149	.1547	.5303	0.120
17. Izumi-gun* (出水郡)	7,382	2,023	(27.40)	3,026	(40.99)	1,587	(21.50)	746	(10.11)	.3011	.1732	.5257	1.311
18. Satsuma-gun* (薩摩郡)	11,169	3,205	(28.70)	4,462	(39.95)	2,451	(21.94)	1,051	(9.41)	.2890	.1719	.5391	5.272
19. Hioki-gun* (日置郡)	21,537	6,319	(29.34)	9,127	(42.38)	4,114	(19.10)	1,977	(9.18)	.3042	.1532	.5426	0.792
20. Kawanabe-gun* (川辺郡)	4,750	1,352	(28.46)	2,119	(44.61)	857	(18.04)	422	(8.88)	.3186	.1454	.5360	1.277
21. Ibusuki-gun* (指宿郡)	10,068	2,757	(27.38)	4,527	(44.96)	1,755	(17.43)	1,029	(10.22)	.3300	.1492	.5208	2.503
22. Nishinoote (西之表)	6,370	1,796	(28.19)	2,590	(40.66)	1,337	(20.99)	647	(10.16)	.2987	.1702	.5311	0.002
23. Yakushima (屋久島)	3,919	1,133	(28.91)	1,626	(41.49)	765	(19.52)	395	(10.08)	.3037	.1607	.5356	0.690
24. Tokunoshima (徳之島)	2,047	805	(39.33)	651	(31.80)	438	(21.40)	153	(7.47)	.2203	.1563	.6235	1.568
Total	388,851	110,012	(28.29)	160,985	(41.40)	78,418	(20.17)	39,436	(10.14)	.3938	.1652	.5310	8.368

*High school students.