On the Recovery and Death-rates of Asylums as Influenced by Size and some other Circumstances. By T. A. CHAPMAN, M.D., Medical Superintendent, City and County Asylum, Hereford.

I have been incited by Dr. Rayner's paper in the "Lancet" of Dec. 30, 1882, to look up various old calculations of mine, bearing on the relation of size of asylums to efficiency and economy, and think it may be worth while to throw them together, that any lesson they may contain may be elicited. I find I have various tables of the relation of cost of maintenance in asylums to their size, and also several relating to the relative rates of recoveries and deaths in asylums of different sizes.

The figures as to variations of weekly cost in proportion to size, give exactly the same results as those which Dr. Rayner has derived from the figures for 1881, but they show them with some variations—chiefly in not showing so pronounced a rise for the large asylums in the earlier years.

1872 shows a rise of 5½d. for the large asylums over the lowest point; 1873, of 3½d.; 1878 shows a rise of 4d. The figures also suggest that the size of maximum economy extends from 400 to 700.

It is worthy of note that the lowest costs are largely determined by the existence of several asylums where lowness of cost is a special feature of the management. In Dr. Rayner's table, for example, the 450-600 class contains Caermarthen, Abergavenny, and Dorset; this does not, of course, detract from the real meaning of the figures, but rather illustrates it, as showing that the special detailed supervision necessary to such low costs can only be efficiently carried on in asylums of not unwieldy size.

An important question suggests itself as to how far cost and efficiency are related—as to whether asylums spending larger sums of money produce better results, and how far a rigid economy may tend to impair efficiency. If we take the divisions made by Dr. Rayner, we find the recovery and death-rates for the last five years as under:—

TABLE A.

Asylums under	Recovery Rate.	Death Rate.	D.	Av. cost. (Dr. Rayner). s.	d.
450	37·0	10·1	3·66	9	7¼
450-600 ...	33·8	9·2	3·66	8	10⅞
600-800 ...	37·6	10·9	3·45	9	3½
Over 800 ...	37·6	10·1	3·72	9	5¾

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These figures are taken from the asylum reports, and differ somewhat from those taken from the Commissioners' Reports used in Table E.

Now, at first view, the cheapest asylums have much the lowest recovery rate, and stand condemned, but we see also on looking further that they have much the lowest death-rate, and it is obvious that if undue economy checked recoveries it would much more increase deaths, and we must conclude that some other circumstances than the cost are at work to produce these ratios. To more clearly indicate this I have placed in column D what might be called a figure of merit, obtained by dividing the recovery-rate by the death-rate. Whilst not suggesting that a figure of merit so obtained correctly represents either merit or a due weighing of death-rate against recovery-rate, it will serve to show that efficiency and expenditure do not in any way rise and fall together.

The true relation of the recovery and death-rates to expenditure appears to me to be illustrated in the following analysis :—

In 19 asylums in which the recoveries and deaths are both below an average, the cost is 9s. 1d. In five asylums in which the recovery and death-rates are both above an average, the cost is 9s. 7d. And in 10 asylums, where the recoveries are high and the deaths low, the cost averages 9s. 6½d., which is identical with that in 18 asylums with a low recovery-rate and a high death-rate—whence we may conclude that an actively moving population, one affording a larger proportion of active disease, whether of a curable or fatal character, adds materially to the costs in asylums. We may tabulate them thus :—

TABLE M.

	Aver. Recovery Rate.	Aver. Death Rate.	Cost.
			s. d.
5 Asylums with high recovery and death-rates.	44·4	10·7	9 7
10 Asylums with high recovery rate, low death-rate.	43·3	8·8	9 6½
18 Asylums with low recovery rate, high death-rate.	32·7	12·1	9 6
19 Asylums with low recovery rate, low death-rate.	34·6	8·7	9 1

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The effect of size on the recovery and death rates is, however, of more importance than the question of its effect on cost, especially from a medical standpoint. I find that I have tables of these facts for 1861-1865, 1866-1869, 1870-1875, and I have now worked them out for 1877-1881.

Now the table for 1861-1865 was beautifully regular, and read thus:—

TABLE B.

Recovery and death-rates in asylums of different sizes based on 219 asylum-years in 1861-1865.

Asylum years.	Size of Asylums.	Admissions.	Recoveries.	Average No. Resident.	Death.	P.c. of recoveries on admission.	P.c. Deaths on average No. Resident.	P.c. Admissions of av. No. Resident.
8	under 100	205	33	411	37	16·40	9·00	50·0
9	100-200	480	140	1,374	136	29·17	9·90	28·6
27	200-300	2,279	835	6,810	681	36·64	10·00	30
49	300-400	5,444	2,174	17,599	1,902	39·93	10·80	32
55	400-500	6,896	2,749	20,491	2,224	39·86	10·85	29
28	500-600	4,840	1,917	14,913	1,669	39·61	11·19	31
15	600-700	2,740	1,088	9,790	1,119	39·71	11·43	35
28	over 700	8,638	2,879	33,402	3,594	33·33	10·76	39
219								

Which may be condensed thus:—

44	under 300	2,964	1,008	8,595	854	33·70	9·93	34
147	300-700	19,920	7,918	62,793	6,914	39·80	11·01	31
28	over 700	8,638	2,879	33,402	3,594	33·33	10·76	39
219		31,522	11,815	104,790	11,362			

This table dealt with 31,522 admissions, and an average number resident of 104,790, and strongly asserted that the curative efficiency of asylums was parallel with their economical, whilst the death rate gradually increased with the size of the asylum, the fall in the death rate of the largest asylums not being sufficient to counterbalance the loss of curative efficiency. However, I waited for a further set of figures before saying anything about these. When the table for 1866-1869 was worked out, it showed that the regularity of the above table was largely fortuitous. The table for 1866-1869 read thus:—

TABLE C.

Recovery and death rates in asylums of different sizes, based on 170 asylum years, 1866-1869.

Asylum years.	Size of Asylums.	Admissions.	Recoveries.	Average No. Resident.	Death.	Recoveries p.c. on admission.	Deaths p.c. on average No. Resident.	Admissions p.c. on av. No. Resident.
10	100-200	532	197	1,487	150	37·03	10·87	35·8
13	200-300	954	382	3,305	329	40·04	9·96	28·8
32	300-400	3,572	1,375	11,279	1,281	38·49	11·36	31·6
41	400-500	5,434	2,068	18,692	1,980	38·05	10·59	29·0
34	500-600	5,993	2,487	18,498	2,287	41·49	12·36	32·4
19	600-700	3,181	1,181	12,163	1,311	37·13	10·78	26·1
21	over 700	8,461	2,925	34,613	3,453	34·57	9·97	24·4
170								

Which may be condensed thus :—

55	under 400	5,058	1,954	16,071	1,760	38·2	10·9	31·5
75	400-600	11,427	4,555	37,190	4,267	39·9	11·4	30·7
40	over 600	11,642	4,106	46,776	4,764	35·7	10·2	24·8
170		28,127	10,615	100,037	10,791			

And for 1870-1875.

TABLE D.

Recovery of death-rates in asylums of different sizes, based on 314 asylum-years in 1870-75.

Number of Asylum years.	Size of Asylums.	No. of Admissions.	No. of Recoveries.	Average No. Restored.	Death.	Percentage of Recoveries on admission.	P.c. of Deaths on av. No. Resident.	P.c. of Admissions of av. No. Resident.
15	under 200	891	346	2,095	313	39·06	14·93	44
41	200-300	3,215	1,122	10,652	1,150	34·89	10·83	30
36	300-400	4,034	1,531	13,053	1,480	37·95	11·32	31
73	400-500	8,953	3,319	32,428	3,421	37·07	10·55	27
46	500-600	8,008	3,154	25,039	2,918	39·44	11·65	32
50	600-700	9,526	3,509	32,314	3,513	36·84	10·87	29
16	700-1000	3,652	1,334	12,843	1,306	36·52	10·18	28
37	over 1000	15,044	5,599	52,409	5,130	37·22	9·78	29
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Which may be condensed thus :—

56	under 300	4,106	1,470	12,748	1,463	35·8	11·4	31
205	300-700	30,521	11,513	102,834	11,332	37·7	11·0	29
53	over 700	18,696	6,933	65,252	6,436	37·1	9·8	28
314		53,323	19,916	180,834	32,231			

These tables do not run by any means so smoothly as Table B, but they give, when condensed, substantially the same results. And it cannot be denied that figures based on 704 asylum-years, and dealing with 112,972 admissions and 385,661 as an average number resident, press any conclusion they point to with great weight, and that conclusion is clearly in favour of moderate sized asylums of from 300-700 patients, as showing a much more satisfactory ratio of recoveries than either smaller or larger ones, but that this is counterbalanced to a decided degree by a higher death rate, though we shall see that the death rate appears to depend on other circumstances than the size of the asylum.

When we come to the figures for 1877 to 1881, we find an entirely different conclusion suggested, and are induced to suspect that the recovery rates may have very little connection with the size of asylums.

Table E.

Recovery and death rates for asylums of different sizes for the five years 1877-1881.

Asylum Years.	Size of Asylums.	Recoveries.	Deaths.
10	under 200	36·0	14·0
16	200-300	35·6	10·2
36	300-400	35·9	9·9
47	400-500	39·9	9·9
55	500-600	35·7	10·0
39	600-700	38·6	11·0
20	700-800	36·7	10·8
12	800-900	38·5	10·3
7	900-1000	39·9	10·4
50	over 1000	42·0	9·7
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I did not take out these figures in the detailed way I had done with those in the former tables, but simply took the

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recovery and death-rates and treated them as of equal value and averaged them. I believe this does not affect the accuracy of the recovery rate higher than the first decimal place, or the death rate above the second decimal place. This table shows, like the others, a low mortality for the largest and for small asylums, and a high mortality for the smallest. The recovery rates range also with the others, viz.: the best ratio for the moderate sized asylums, and worse rates above and below, with, however, this all-important exception that asylums over 900 have the best recovery rates of any.

This high recovery rate for large asylums is at first sight perplexing, being in direct contradiction to the teaching of the preceding Tables, and suggests that large asylums have during the past five years conquered the difficulties that previously beset them. But I believe they have no such meaning, and that the key to the position will be found in Table F.b.

I have endeavoured to ascertain what other forces dominate the recovery and death rates, with a view to interpreting the above tables. The meagreness of the items, in this direction, that I have been able to elucidate, is due very much to the paucity of any available material on which to found statistical inquiry, and to some extent to the laboriousness of collating the materials that do exist. There are still in the Table of Asylum Reports some materials that I hope some day to examine, but I do not yet see how to bring them to bear satisfactorily, even with much tedious work upon them.

There is a powerful element governing the recovery rates, in the different class of cases admitted into different asylums; indeed this is probably beyond all others the dominant element, but unfortunately we have hardly any statistical means of investigating it. We see marked instances of its influence in the case of Hanwell, where statistics wonderfully improve on the opening of Banstead, whose statistics however are very bad, the reason being that Hanwell gets a larger share of favourable cases than before, Banstead the unfavourable. A similar element appears to exist in the improvement of the Prestwich statistics on the opening of Whittingham.

It has occurred to me that Table XI. of the Commissioners' reports can be used to throw a little light on this point; by comparing Table XI. for 1878 with that for 1882 we may determine those counties where the increase of the

proportion (not the number, but the proportion) of patients in asylums at the expense of home and workhouse cases is going on most rapidly. These asylums must be receiving among their admissions a larger proportion of chronic cases than other asylums are, and in these we should therefore expect to find a lower recovery rate and probably also a lower death rate, though these workhouse cases often afford many non-viable cases of cerebral disease.

Nineteen counties have added to their asylum population at the expense of the home and workhouse cases more than 4·5 p.c. of their total lunatics during the five years. Of these counties only one reaches a recovery rate of 39·1, and only two others are above 35.

If, on the other hand, we take the nine counties (not asylums) with recovery rates above an average, we find that they have added only 2·2 p.c. The reverse does not hold good in the twelve counties with the lowest increase of workhouse cases in asylums, but show a recovery rate of only 37·2. But this group contains Staffordshire, which for some reason has very bad statistics, and also Oxford, Berks, and Cambs., which belong naturally to the group with large increase of workhouse cases, so that one suspects here some error in the returns.

The 19 counties in the first group are chiefly agricultural, Durham being an exception I cannot explain; Middlesex is an exception that is explainable by the filling of the Banstead Asylum during the period covered by the Table.

From the same Table XI. of the Commissioners' Report, however, a still stronger light may be thrown on the real cause of high and low recovery rates. In many counties workhouses are largely used as receptacles for lunatics, and if we make a list from this table of those that appear to do so most, and those that appear to do so least, we find that the first group contains all, with three exceptions, the asylums with good recovery rates, whilst the other group only contains asylums with low rates of recovery also with one exception.

It is therefore obvious that whatever may obtain in the three exceptional counties, that, in those with high rates of recovery and large use of workhouses, a selection of cases for asylum treatment is made, the workhouses getting the unfavourable cases. In those where workhouses are sparingly used, the asylums get all the cases.

These figures may be tabulated as in Table F on opposite page.

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TABLE F.

Relation of Recovery Rate to the Increase (per cent.) of Lunatics in the Asylum, at the Expense of Homes and Workhouses.

NUMBER OF COUNTIES.	Average Increase of Percentage in Asylums.	Average Recovery Rate.	Highest Rate of Recovery.	Lowest Rate of Recovery.	Death Rate.
19 Counties, With over 4·5 increase, viz., Hereford (13·0), Northumberland (8·9), Worcester, Dorset, Wilts, Durham, Northampton, Middlesex (Beds, Herts, Hunts), 5 North Welsh Counties, Norfolk (5·7), Hants (4.8), Somerset (4·6)	6·8	33·7	39·1	27·1	9·7
9 Counties, With over average Recovery Rate, viz., Surrey (4·4), Leicester, North Riding, Chester, Lancaster, E. Riding (1·8), Cumberland (1.7), Essex (1·4), Gloucester (0.7)	2·2	43·3	51·0	40·1	10·8
12 Counties, With low increase (1·8 to 2·5)	0·2	37·2	51·0	28·4	9·6

TABLE F.b.

No. of Counties..	Percentage of Lunatics in Workhouses.	Average percentage of Total Lunatics in Workhouses.	Recovery Rate.
5	over 30 p.c.	33·1	40·9
14	20 to 30 p.c.	22·5	36·9
8	under 15	13·0	31·2

As this table throws more light than any other on the question as to whether giant asylums have good recovery rates owing to their size, I give the items of this table in

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full, and have marked those counties that have giant asylums. It will be seen that these hardly have recovery rates in due proportion to the use they make of workhouses.

I have only omitted certain Welsh counties, which are too muddled together for the purposes of this table.

TABLE F.b2.

Counties.	Percentage of Cases in Workhouses.	Recovery Rate.
Middlesex	36·3*	34·7
Lancaster	36·2*	40·1
Gloucester	32·6	46·7
E. Riding	30·5	41·2
Surrey	30·3*	41·9
Stafford	26·6	28·4
West Riding	26·4*	37·1
Sussex	23·2	31·5
Salop	22·9	37·6
Montgomery	22·1	
Somerset	22·5	37·1
Westmoreland	22·4	51·0
Cumberland	19·2	
Southampton	22·2	36·4
Northampton	22·2	28·0
Kent	22·0*	36·8
Chester	21·5	42·1
Derby	21·1	39·0
Notts	20·7	35·3
Devon	20·6	38·3
Warwick	20·1	34·5
Three counties with high recovery rates and smaller percentage in Workhouses.		
Essex	18·6	40·2
N. Riding	11·8	43·8
Leicester	17·9	42·8
Six asylums with less than 15 p.c. in Workhouses.		
Bucks	14·1	34·2
Dorset	14·1	34·6
Cambridge	13·4	31·2
Beds (Herts, Hunts)	12·8	27·1
Hereford	12·4	33·8
Glamorgan	11·1	26·6

* Have giant asylums.

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The three counties that are exceptional in this table appear, however, by Table F, to receive but a small ratio of "workhouse cases."

The question how far high recovery and death rates are concomitant or antagonistic is interesting, and I have worked out the following tables:—

TABLE G.

Recovery rates corresponding to given death rates. Years 1877-1881.

Death Rate.	No. of Asylum Years.	Recovery Rates.
Under 6 p.c.	14	40·8
6-7 ,,	18	40·9
7-8 ,,	22	40·4
8-9 ,,	40	39·5
9-10 ,,	43	40·4
10-11 ,,	49	38·7
11-12 ,,	32	38·8
Over 12	59	35·7

TABLE H.

Death rates corresponding to given recovery rates. Years 1877-1881.

Recovery Rates.	Number of Asylum Years.	Death Rates.
Under 20 p.c.	5	10·1
20-25 ,,	10	9·9
25-30 ,,	29	10·9
30-35 ,,	54	10·6
35-40 ,,	74	10·2
40-45 ,,	56	10·2*
45-50 ,,	36	9·8
Over 50 ,,	28	9·1

A certain allowance must be made here for such instances as that of Hanwell and Banstead, where one asylum has good statistics at the expense of another. I do not think that these instances are sufficiently numerous to materially affect the broad result of these tables.

From these it distinctly appears that low death-rates go with high recovery rates and *vice versâ*, notwithstanding that many individual asylums present statistics very much the other way.

* Omitting a small Borough with 24·2 p.c.

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As the death rates rise from 6 to 12 per cent. the recovery rate falls from 40·8 to 35·7. This would have been seen without the intervention of the slight fluctuations shown in the table, had the death rates been grouped thus: Under 7 p.c., 7-10 p.c., 10-12 p.c., over 12.

In Table H the lowest recovery rates (under 25 p.c.) have low death rates, but as these are founded on only 15 asylum years they may be neglected as not appreciably interfering with the main indication of the table, that as the recovery rate rises from 25 to 50, so the death rate falls from 10·9 to 9·1.

I do not think these tables justify any conclusion to the effect that the ranges of recovery and death rate shown are a measure of the effect that may be produced on these rates by differences of efficiency in the several asylums, viz., that the recovery rate would, *cæteris paribus*, be found to be, if we could ascertain the fact, 5·0 p.c. higher, and the death rate 1·8 p.c. lower in the most efficient asylum than in the least so, though I am inclined to believe that the tables do contain an element pointing in that direction.

Table K.

Table showing the Relation of the Death Rate to the Percentage which the Admissions bear to the Average Number Resident. 1877-1881, based on the average for five years.

Number of Asylums.	Admission percentage of Average No. Resident.	Death Rate.			No. of Asylums Below 10 p.c.	Percentage of Asylums Below 10 p.c.
		Average.	Lowest.	Highest.		
4	16—20	7·1	4·6	9·7	All	100
15	21—25	9·0	6·5	11·2	13	86
20	26—30	10·6	7·9	13·1	7	35
12	31—35	10·7	6·6	14·3	4	33
7	Over 35	12·9	8·6	17·0	1	14

This table shows the most unmistakable relation between

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the facts exhibited in it of any I am able to give. I showed some years ago that the recent admissions present much the largest death rates. I may briefly summarise the facts there shown thus:—

TABLE L.

Mortality of Patients during different Years of Residence in Asylums, p.c. of Av. No. Resident.

During 1st Year.	2nd Year.	3rd Year.	4th & 5th Year.	6th & 10th Year.	Over 10 Years.
23·93	12·02	10·45	7·69	5·67	4·93

From this evidence we might have been certain without Table K that asylums whose admission bore a high ratio to their average number resident would present a correspondingly higher death rate, as they must have a larger proportion of patients of shorter periods of residence.

If we return to Tables B, C, and D, in each of which I have placed a column showing the ratio of admission to average numbers, and arrange these ratios in order, with the corresponding death rates thus, we find that the death rates follow them exactly, with two exceptions: 1st, where the numbers involved are small, so that a fair average is not attained; 2nd, in two of the tables in favour of the large asylums.

TABLE N.

From Table B.		From Table C.		From Table D.	
28·6	9·9	24·4	9·97*	27	10·55
29·	10·85	26·1	10·78	28	10·18
30·	10·	28·8	9·96 small basis	29	9·78*
31·	11·19	29·0	10·59	29	10·87
32·	10·80	31·6	11·36	30	10·83
35·	11·43	32·4	12·36	31	11·32
39·	10·76*	35·8	10·87 small basis	32	11·65
50·	9·0 small basis			44	14·93

It is possible to select a group of asylums belonging to rural and agricultural counties that have a low rate of mortality. Thirteen such selected counties have an average death rate of 8·3, whilst a group of seven manufacturing counties can be selected having a high mortality, viz., 12·3. The recovery rates in these two groups, 35·9 and 34·4, do not

* Large asylums.

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appear to be specially affected by this line of selection; whilst there are several notable exceptions that have to be omitted from both lists, viz., Lincoln 13·8, Norfolk 10·9, Sussex 11·2, Hants 12·2, and Suffolk 14·3 from the rural group; and Hanwell, Prestwich, and one or two others perhaps are exceptions in the urban and manufacturing group. Then, of course, such counties as Worcester, Northumberland, &c., are too mixed to belong distinctly to either.

There are a few asylums where there are special circumstances that make their statistics unusual, and either remove the asylum from the group to which it belongs, or if kept within it destroys the special features of the group. In only the rarest instances have I any idea what these special circumstances are. In Table K Prestwich takes a very exceptional place, belonging to a group with a 10·7 mortality, and yet it has a mortality of only 6·6. Prestwich is indeed a trump card in the hands of any one who advocates large asylums on the ground of their favourable statistics, and it must be conceded that the very efficient state and high organization of that asylum must have their effect in improving these statistics; but a reference to Table F and F.b2 will show that the high recovery rate is due most of all to a selection of cases, the less favourable being remitted to the workhouses. A reference to Table K would suggest that it ought to have a high death rate, whereas it has one of the very lowest. Prestwich, however, presents an unusual figure in its statistics which probably points to the most potent element in producing this low death rate, and that is the very large proportion of cases discharged unrecovered, including doubtless many cases returned to the workhouses that would otherwise have swelled the mortality. Suffolk, in the same group, has, on the other hand, a mortality of 14·3. In this instance we are aware that the sanitary condition of the asylum has been very defective. Stafford again has very poor statistics, for which I can only suggest the exceptional conditions known to affect the industrial population of that county.

The conclusions at which I arrive after this investigation are still unfavourable to large asylums, but I confess not so strongly as, derived from a more limited view of the statistics, they were before I commenced it.

I.—As to *Cost*, Table M. suggests that the cheapness of moderate-sized asylums is due not entirely to their size, but also to the circum-

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stance that they happen to contain a smaller proportion of active disease amongst their patients; if the tables may be implictly trusted, about one-third of the saving in cost is due to this circumstance.

II.—As to *Recoveries*. In the earlier periods when large asylums were neither so numerous nor so gigantic as now, they had a comparatively poor rate of recoveries, and they maintained this position until the last five or six years, during which they present very much the most favourable rates. This improvement in recent years is, however, fully, I am inclined to think more than fully, discounted on noting that these large asylums belong to large and populous districts, with considerable differentiation in the modes of accommodating lunatics—in Middlesex and Surrey by the Metropolitan District Asylum, and in the others by large lunatic wards to workhouses—the asylums receiving selected favourable cases, the workhouses the unfavourable. In Tables F and Fb, Surrey is the only county with large asylums that maintains a relatively good position.

III.—As to *Death-rates*, the proportion which the admissions bear to the average number resident is much the most powerful element governing the death rate. Of the large asylums, Hanwell and Prestwich both take a good position from this aspect. I have already alluded to the exceptional causes of this in these instances. Wandsworth also takes a good position, and throughout the large asylums appear to advantage from this point of view; a circumstance that is probably, however, to be largely explained by the use made by them of workhouses, either by sending to them in the first instance or transferring to them afterwards the least hopeful cases.

IV.—As conclusions reached by the way and more firmly established, as well, perhaps, as of greater, if not more practical, interest than those bearing on sizes of asylums, I may note—

(1) That a rapid increase in the proportion in the asylum of the total lunatics of a district, which is more or less synonymous with the free admission of chronic cases previously kept in workhouses or at home, results in a low ratio of recoveries, without any distinct effect on the death rate, but probably slightly reducing it. (See Table F.)

(2) That the accommodation of a large proportion of the lunatics of a district in workhouses results in selected cases being sent to asylums, and consequently these asylums present higher rates of recovery. (See Table Fb.)

(3) That satisfactory recovery rates tend to go with satisfactory death rates (Tables G, H), and after allowing for such disturbing elements as noted above (2), and for certain asylums showing good rates at the expense of others, there is a probable margin due to efficiency.

(4) That the proportion of admissions to the average number resident determines more than anything else the death rates of asylums. (Table K.)