Mortality of Burns at the Massachusetts General Hospital, 1939–1954 *

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Accurate knowledge of the mortality of burns is essential for the evaluation and instructive comparison of different types of therapy, and for a clear understanding of the prognosis in the individual burned patient. Furthermore, the implications of caring for large numbers of burned casualties are best appreciated knowing the present record of therapy of burns. The reports of Bull and Squire [2] and of Moyer [12] on mortality of burns by making allowance for the age of the patient and the extent of the burn have contributed much information of value. Earlier reports have presented an overall mortality in a series of burns without complete consideration of their extent or of the age of the patient.[8, 13, 14] These studies, lumping together large numbers of patients, have been helpful in defining only an approximate mortality. Over 50 years ago Weidenfeld [15] recommended the correlation of the prognosis of burns with their surface extent, recognizing in addition the importance of the age of the patient. However, his clinical material was too limited to permit more than an approximate definition of mortality of burns at the start of this century.

This paper considers the mortality data derived from experience with burns at the Massachusetts General Hospital over a period of 15 years from 1939 to 1954 inclusive. The data on which this study is based were collected in a general teaching hospital with approximately 850 beds, located in a metropolitan area of two and a half million people. We are indebted to Bull and Squire [2] for introducing into the analysis of clinical material the method of treatment employed here, namely, probit analysis. We believe this type of statistical treatment will be extended to many varieties of clinical experience as its advantages are recognized.

The material presented has been studied with two ends in view: a description of the mortality of burns by means of a probit analysis, and an evaluation of the trends in mortality by conventional statistical technics.

MATERIAL AND METHOD OF ANALYSIS

Selection of Burned Patients. A series of burned patients requiring hospitalization for treatment during the 15-year-period, 1 July, 1939, to 30 June 1954, is the basis of this study. A group of approximately 30 well documented, minor, non-fatal burns treated by the members of the research staff in their outpatient practice is included as well. Save for the exceptions listed below *all* patients hospitalized in this 15-year-period are included; external thermal, external chemical, and electrical burns are represented in this series. These share a common therapeutic problem. The following categories of injury, often loosely referred to as "burns," have been excluded because they do not have comparable ther-

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apeutic problems: chemical burns caused by the ingestion of injurious substances or by the use of abortifacients, reactions to ultraviolet radiation, x-radiation and gamma-radiation effects, and injuries of the respiratory tract due to the inspiration of hot gases and irritating vapors when not associated with any external burn. These latter cases have a variable degree of asphyxia associated with respiratory tract trauma and present special therapeutic problems. However, any surface burn combined with a pulmonary burn is included on the basis of the area of skin involved. Finally, any patient admitted two weeks after sustaining a burn is excluded from the series, inasmuch as this type of patient was not under the jurisdiction of this hospital during a very critical phase of management. Also it is believed that the inclusion of these patients would lead to a more optimistic estimate of the survival of patients with severe burns, because only those who had survived the initial precarious period of fluid imbalance and early sepsis could be referred for further therapy. Cases referred to the hospital after the immediate postburn period but prior to the lapse of two weeks were few in number, and were included in the study. Their clinical course represented a "problem case" for the referring institution, and they required the more specialized care available in a teaching hospital.

Therapy. The majority of the burns reported in this series were treated in accordance with the physiological principles of therapy described elsewhere.[4-7, 10, 11, 17] Not all the burns received what is regarded today as the most enlightened therapy. Few therapeutic series extending over a period of years can achieve any large measure of uniformity. This is a consequence of the accelerating tempo of medical research. The inclusion of burns treated as early as 1939, when antibiotic therapy was limited to the sulfa drugs and when intravenous therapy in the acute phase had not been fully developed, has the disadvantage of weighting the overall mortality in an unfavorable direction because of the primitive measures of care then current. However, the reliability of the results in this statistical treatment is increased by utilizing the large number of burns treated over a 15 year period.

In the evaluation of the trends in mortality the series was divided into two parts, 1939–1942 and 1943–1954. The earlier period contains patients treated by primitive technics whereas the latter period extends over the introduction and maturation of our present concepts of fluid, antibiotic, and nutritional therapy.

Classification of Burns. A simple and reasonable classification of burns may be based on their surface extent and on the age of the patient. Each burn is classified according to the age of the patient to the nearest whole year and according to the extent of the burn, expressed as per cent of the total body surface following the values given by Berkow[1] for the percentages assigned to each anatomical area. The final evaluation of the extent of the burn is based collectively on the estimate at the time of admission, the operative notes of dressing or grafting procedures, progress notes, photographs, and on more detailed research records. In general, these various sources agree closely with the estimates recorded at the time of admission. Since the majority of the patients considered in this report were treated after 1942, when an active interest emerged in prescibing the required fluid therapy in the acute phase of a burn in direct proportion to the extent of the injury, the records contain an unusually accurate appraisal of the area of the burn. The total area of the burn is used because of the inaccuracy in determining the extent of second- and third-degree burns. It has been stated[2] that a closer correlation may exist between the extent of a second plus third-degree burn and survival, than between the total extent of a burn and survival. However, considering the uncertainty in estimating the former in comparison to the latter, presumably less ambiguity is introduced by accepting the total area of the burn as a measure of its severity.

Probit Analysis. As will be shown subsequently, our experience with burns conforms approximately to a sigmoid response curve displayed in Figure 2 based on the data in Table II. This is an awkward curve to deal with mathematically, and a simple conversion of the mortality scale ordinate enables a further description of the data in terms of a linear function. If the mortality in per cent is converted from a linear scale to a probability scale, it is possible to calculate a simple linear function that relates the mortality to the area burned. To accomplish this calculation a statistical unit called a *probit* is employed for the mortality scale. The linear distance represented by 1 probit is equal to 1 standard deviation, also called a normal equivalent deviate, on the probability scale. Thus if a probit value of 5 is arbitrarily defined as the value corresponding to 50 per cent mortality, the range of mortalities between probit values of 4 and 6 is 16 to 84 per cent, a range of 2 standard deviations; between probit values of 3 and 7, 2.5 to 97.5 per cent, a range of 4 standard deviations, etc. The equivalence of the mortality probability scale expressed in per cent to the linear probit scale is displayed in Figure 3 where the results of the transformation may be appreciated by comparison with Figure 2. The detailed arithmetical steps in this procedure have been stated by Finney,[9] and the general principles of the analysis are clarified by a specific application (*vide infra*). The advantage of probit analysis in this study is fourfold. In the first place, instructive and comprehensible conclusions may be drawn from an incomprehensible and confusing array of crude data. Secondly, the regression lines of mortality probit on area burned are determined largely by those points which represent the greatest experience with burns and which have, therefore, the greatest statistical validity. Points which represent an extremely low mortality, an extremely high mortality, or which represent a small number of patients have less weight in the final determination of the position of the line. Thirdly, the mortality rates computed from the larger groups of burns are permitted to increase the accuracy of the estimates of the mortality in the smaller groups. Fourthly, an estimate of the fiducial limits of the regression lines may be calculated so that an approximation of the error of the method is available.

TABLE I. *Distribution of 949 Burns Treated at the Massachusetts General Hospital*

		Number of Patients
Total fatal burns (regardless of extent or age of patient)		86
Non-fatal burns:		
Burns of less than 1% extent	164	
Burns of 1% extent in patients 10 years of age or more	82	
Subtotal	246	
Burns of 1–9% extent in patients 9 years of age or less	113	
Surviving burns not included in above groups	504	
Total	863	863
Grand Total		949
Non-fatal burns of less than 1% extent		164
Total Cases for Probit Analysis		785

MORTALITY OF BURNS

Crude Data. On the basis of the stated method of selection a total of 949 burns treated at the Massachusetts General Hospital is available for study. In Table I the distribution of the burns is listed in groups related to the graphical representation of the experience in Figure 1. Because of the

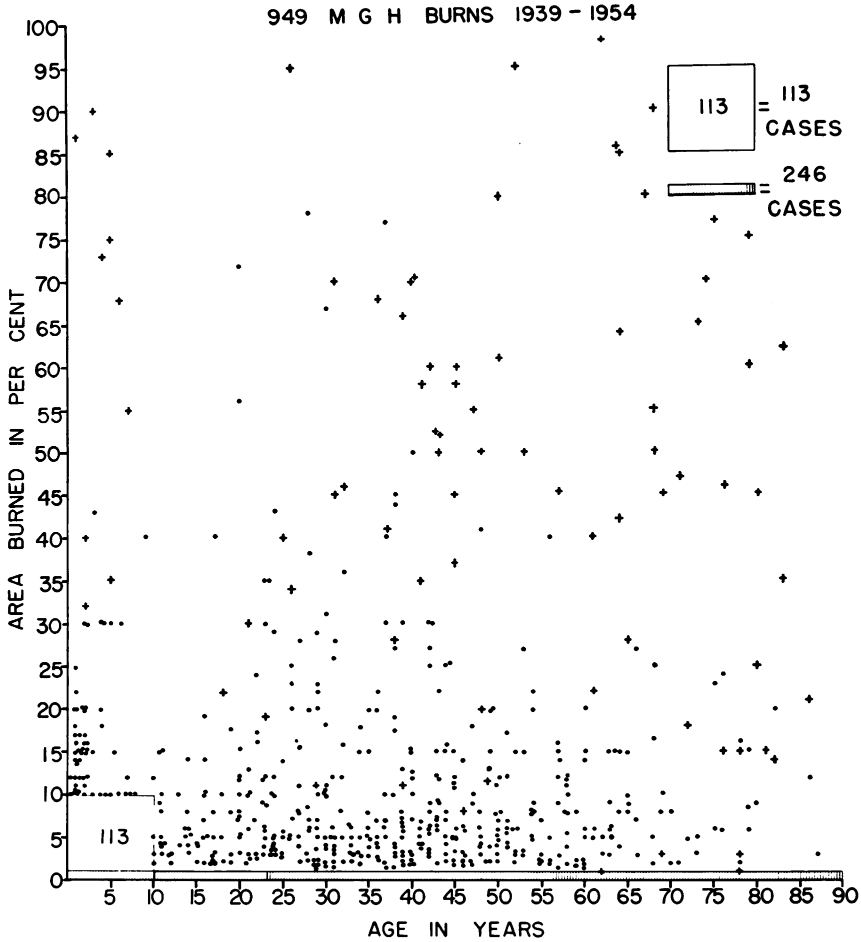

FIG. 1. Distribution of burned cases. Each dot or cross represents respectively an individual survivor or death of an injury by burning. The various groups of burns are tabulated in Table I.

congestion of points in certain areas it is necessary to list groups of non-fatal burns. All fatal burns are indicated on the chart regardless of their extent. Burns covering less than 1 per cent of the skin area were not lethal, and in view of the fact that the patient was generally hospitalized for associated fractures, lacerations, etc. sustained at the time of the burn, 164 non-fatal burns of less than 1 per cent were removed from the overall group. A group of 785 burns remains for further study.

Grouping of Data. To evaluate the mortality of a burn the series of 785 cases is divided according to age groups and according to the extent of the burn. Four age groups were chosen: 0–15 years, 16–35 years, 36–55 years, and 56–100 years. These age groups correspond to a childhood period, a period of greatest strength and resistance to disease, a transitional period extending through the age of 55 during which resistance and physiologic flexibility decrease, and a final period when associated problems of degenerative diseases and rapidly declining resistance emerge with increasing frequency to complicate therapy of burns. Eleven groups were chosen for the extent of the area burned, and Table II presents the crude data in these groupings.

TABLE II. *Area Burned in Per Cent*

Age in Years		1–4	5–14	15–24	25–34	35–44	45–54	55–64	65–74	75–84	85–94	95–100			Grand Totals
	Patients surviving	85	89	23	8	2		0	0	0	0		207		
	Patients dead	0	0	0	1	2		1	2	1	3			10	
0–15	Total	85	89	23	9	4		1	2	1	3				217
	Mean age	5.3	4.8	2.8	3.3	4.8		7	5	5	3		4.7		
	% mortality	0.0	0.0	0.0	11.1	50.0		100	100	100	100				
	Patients surviving	98	74	20	9	6	0	1	2	1		0	211		
	Patients dead	0	1	2	2	1	2	0	1	0		1		10	
16–35	Total	98	75	22	11	7	2	1	3	1		1			221
	Mean age	25	25	26	27	25	32	20	27	28		26	25		
	% mortality	0.0	1.3	9.1	18.2	14.3	100	0.0	33.3	0.0		100			
	Patients surviving	80	76	21	10	3	2	0	0	0		0	192		
	Patients dead	0	3	1	1	3	6	6	4	2		1		27	
36–55	Total	80	79	22	11	6	8	6	4	2		1			219
	Mean age	45	45	45	42	41	44	45	39	44		52	45		
	% mortality	0.0	3.8	4.6	9.1	50.0	75.0	100	100	100		100			
	Patients surviving	31	39	18	1	0	0	0	0	0	0	0	89		
	Patients dead	4	2	8	3	3	6	4	2	3	3	1		39	
56–100	Total	35	41	26	4	3	6	4	2	3	3	1			128
	Mean age	66	65	71	70	66	70	74	74	74	65	62	68		
	% mortality	11.4	4.9	30.8	75.0	100	100	100	100	100	100	100			
	Grand total of patients dead	4	6	11	7	9	14	11	9	6	6	3		86	
	Grand total of patients	298	284	93	35	20	16	12	11	7	6	3			785
	Group % mortality	1.3	2.1	11.8	20.0	45.0	87.5	91.7	81.8	85.7	100	100			11.0

The series of 785 burns has an overall mortality of 11.0 per cent. This figure is in part a reflection of the distribution in the series of major and minor burns and is only of descriptive significance.

In the calculation of the probit regression lines the data in Table II contain groups with too few burns to permit a satisfactory statistical treatment. Consequently, further consolidation of the groups into classes defined by a greater range in the extent of the burn is necessary as shown in Table III. The four age groups remain unchanged from Table II as do the last three vertical columns in the body of the table. However, for extensive burns where only limited experience is available in each age group, the indicated groupings have been carried out. The mean area burned in each of the consolidated classes has been calculated to avoid any bias that might be introduced by accepting the midpoint between the limits of a class as representing the mean area.

Normal Distribution of Data. If the data in the bottom line of Table II for the combined age groups are abstracted, they may be graphed as in Figure 2. In this figure the data appear to follow a characteristic curve and, by methods presently to be outlined, a sigmoid curve has been placed in Figure 2 as the best calculated curve to represent the points. It is to be noted that the distribution of the points along this curve suggests a rather good fit, except in the area of 80 to 90 per cent mortality. However, the departure here is to both sides of the curve, and there appears to be

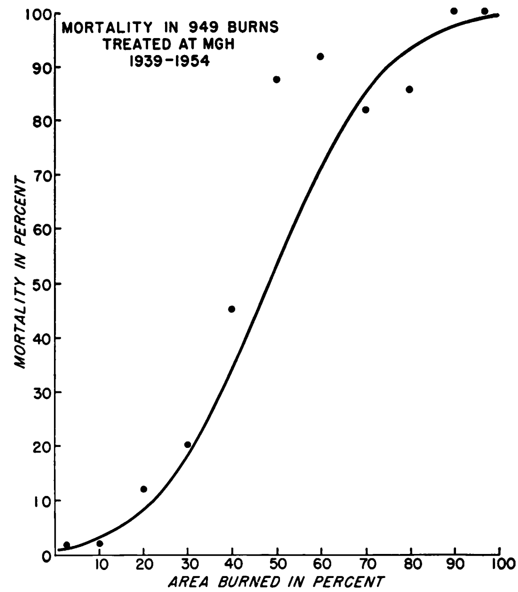

FIG. 2. Over-all mortality. The linear mortality scale here is to be contrasted with the probability mortality scale of Figure 3.

no clear systematic deviation from the calculated curve. The four points in the region of 80 to 90 per cent mortality represent the experience with 46 burns, and mortality rates based on such limited numbers are subject to a wider deviation due to sampling errors.

Because of the reasonable closeness of fit to the sigmoid curve and because it is reasonable to suppose that the death or survival of a burned patient is the consequence of the random interaction of a multitude of independent and interdependent causes, we can expect that a large group of burns might exhibit a response curve similar to that displayed in Figure 2. This curve is a graphical statement of an empirical fact of biological behavior relating the response of an organism following graded external stimuli to the random distribution of numerous factors, each of which influences independently the type and the extent of the response. In the case of a burn, success or failure in therapy is determined in part by the following unrelated factors among countless others: depth of burn, lapse of time between injury and therapy, presence of intercurrent infections, associated degenerative diseases, development of drug resistant organisms, prior nutrition, transfusion reactions, allergic reactions to drugs, immune response of the patient, severity of sepsis, nursing care, professional judgement, etc. The interpretation of mortality of burns by means of a sigmoid curve was introduced by Clarkson and Lawrie,[3] and the significance of this was recognized first by Bull and Squire.[2]

Mortality Probit on Area Burned Regression Lines. In Figures 3, 4, and 5 are the probit regression lines representing the mortality in the overall series and in the four age groups. The regression lines are established by an arithmetical calculation similar to that employed in computing simple regression lines by the method of least squares.[9] The probit transformation may be clearly seen in comparing Figure 2 with Figure 3. In Figure 3 the regression line is computed from the data in the bottom line of Table III. This line represents the best mathematical fit for the overall series, and the departures from this line may be either the result of sampling errors, as previously mentioned, or the heterogeneous influence of combining all age groups. That this is contributory may be appreciated by noting the points and lines in Figures 4 and 5 where individual age groups are used instead of the overall series. The sigmoid curve in Figure 2 is obtained from the straight line in Figure 3 by replotting the line on the linear mortality scale in Figure 2.

Mortality Contours. From the lines of Figures 4 and 5 are plotted contour lines representing the mortality rates in Figure 6. The mortality curves are displayed extending from 5 through 70 per cent. For example, from Figure 4 the extent of the burns associated with a mortality of 5, 10, 20, 30, 50, and 70 per cent is determined by inspection for the younger age group, which has a mean age of 4.7 years. In Figure 6 five points which represent the areas

TABLE III. *Area Burned in Per Cent*

Age in Years		1–4	5–14	15–24	25–34	35–44	25–54	55–94	55–100			Grand Totals
	Patients surviving	85	89	23	8	2		0		207		
	Patients dead	0	0	0	1	2		7			10	
0–15	Total	85	89	23	9	4		7				217
	Mean age									4.7		
	% mortality	0.0	0.0	0.0	11.1	50.0		100				
	Mean area	2.5	10	20	30	40		76				
	Patients surviving	98	74	20			15		4	211		
	Patients dead	0	1	2			5		2		10	
16–35	Total	98	75	22			20		6			221
	Mean age									25		
	% mortality	0.0	1.3	9.1			25.0		33.3			
	Mean area	2.5	10	20			33		73			
	Patients surviving	80	76	21			15		0	192		
	Patients dead	0	3	1			10		13		27	
36–55	Total	80	79	22			25		13			219
	Mean age									45		
	% mortality	0.0	3.8	4.6			40.0		100			
	Mean area	2.5	10	20			37		68			
	Patients surviving	31	39	18			1		0	89		
	Patients dead	4	2	8			12		13		39	
56–100	Total	35	41	26			13		13			128
	Mean age									68		
	% mortality	11.4	4.9	30.7			92.3		100			
	Mean area	2.5	10	20			39		74			
	Grand total of patients dead	4	6	11			30		35		86	
	Grand total of patients	298	284	93			71		39			785
	Group % mortality	1.3	2.1	11.8			42.3		89.7			11.0

burned corresponding to the stated mortalities are plotted in a vertical row over the age of 4.7 years. The adjacent vertical rows of points are over the successive mean ages of 25, 45, and 68. Inasmuch as there is no reason to suspect any discontinuity in mortality contours, these series of points have been connected by freehand curves. The higher mortality curves are not sketched in because the variation in the method does not permit drawing curves on which any practical degree of reliance may be placed beyond the 70 per cent contour.

The mortality contour grid permits one to determine the mortality of an injury based on past experience if the age of the patient and the extent of the burn are known. For example, a 55-year-old patient with a 30 per cent burn has an injury associated with a 40 per cent mortality (point in Figure 6 defined by age and area burned falls half way between 30 and 50 per cent contours). This patient on the basis of past experience has 6 chances out of 10 to survive the injury, other things being equal. Clearly an associated cardiac problem or other disease would increase the risk of this thermal injury just as unusual vigor and health would tend to decrease the risk. As is well known in the proper application of a statistically determined mortality rate to a specific patient, the rate must be mod-

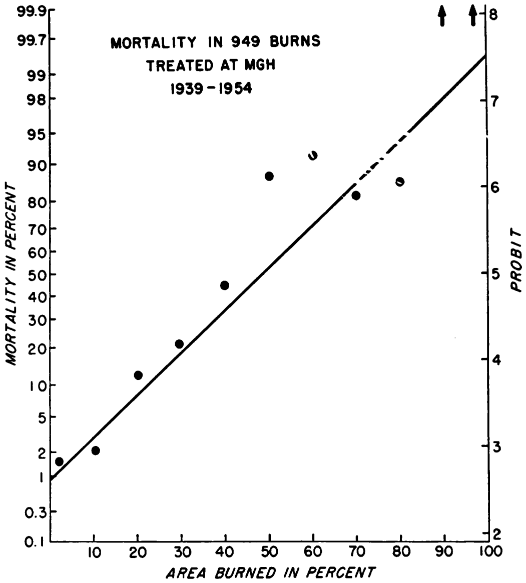

FIG. 3. Regression line of overall mortality probit on area burned. $y = 2.62 + 0.0491x$. The probability mortality scale here is to be contrasted with the linear mortality scale of Figure 2. The effect of the probit transformation is apparent in comparing these two figures. The arrows indicate points beyond the limits of the figure. These are given little weight in determining the position of the regression line.

ified depending on the overall clinical situation. However, the computed mortality rate is a firm point of departure in such considerations.

Variability of Mortality Contours. It has been previously stated that the fourth advantage of the probit method of analysis is that an estimate of the variability of the points on which the contours are based may be obtained. Fiducial limits of the 5, 20, and 50 per cent contours at the ages of 4.7, 25, 45, and 68 years are stated in Table IV. Statistical theory has not yielded an entirely satisfactory solution for the precise definition of the fiducial limits in a probit analysis involving the numbers of patients considered here, and Finney's formula [9] (p. 63) has been applied without any correction for heterogeneity to obtain the approximate fiducial limits in Table IV. The limits chosen ($P = 0.95$) indicate the approximate range of area burned within which the particular mortality contour line will fall 19 chances out of 20. It is to be emphasized that the mortality contours based on the more severely burned patients do not have the same degree of reliability as the mortality curves based on groups of burned patients in which experience is more numerous. Where additional cases have contributed information, it may be seen that the fiducial limits are more restricted. The mortality curves are primarily of descriptive interest, and they are the most precise and succinct way of defining the results of treatment of burns from our experience.

TRENDS IN MORTALITY

Standard Burn Population. The evaluation of trends in mortality as an indication of the beneficial effects of improved therapy of burns necessitates the comparison of the mortality rate of different periods. Three periods have been selected: 1939–1942, an era of primitive care of burns; 1943–1947, an era of developing fluid and antibiotic therapy; and 1948–1954, an era of further expansion in antibiotic therapy and of increasing nutritional support. Inasmuch as the three periods are not strictly identical in the proportions of severe and mild burns treated, a direct comparison of mortality rates is misleading. A *standard burn population* permits a comparison.

On the basis of a review of 736 records available from the series subjected to the probit analysis, three groups of burns are defined by means of the age and extent of the burn: young and less extensively burned patients, an intermediate group, and old and more extensively burned patients. The groups are approximately those obtained by dividing the patients according to the mortality contours of 5 and 30 per cent in Figure 6. Between these contours are the cases of the intermediate group, while the cases below the 5 per cent contour or above the 30 per cent contour are in the extreme

TABLE IV. *Approximate Fiducial Limits of Mortality Contours (P = 0.95)*

Mortality Contour	Age: 4.7 years % Burn	Limits	25 years % Burn	Limits	45 years % Burn	Limits	68 years % Burn	Limits
50%	39	34–59	65	50–100	39	33–50	26	22–33
20%	33	27–43	43	32–64	27	22–33	14	10–19
5%	27	16–33	21	9–32	14	7–20	4	0–9

TABLE V. *Derivation of Standard Population and Weighting Factors*

Mortality Period	Group I <6% Dead	Total	Group II 6–30% Dead	Total	Group III >30% Dead	Total	Totals Dead	Total
1939–42	5	99	3	20	12	14	20	133
1943–47	1	168	6	49	23	31	30	248
1948–54	0	255	5	65	29	35	34	355
Grand Totals (Standard Population)		522		134		80		736
Weighting Factors		0.709	+	0.182	+	0.109		= 1.000

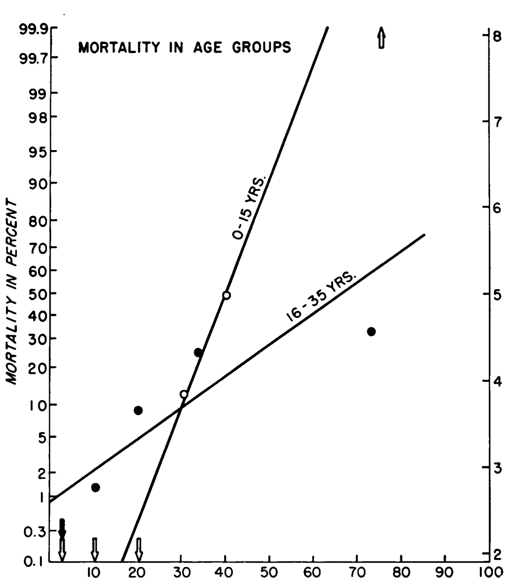

FIG. 4. Regression line of mortality probit on area burned in age groups 0–15 and 16–35 years. $y = -0.25 + 0.133x$ and $y = 2.60 + 0.0363x$. The open symbols refer to the younger age group. The arrows are explained in the legend of Figure 3.

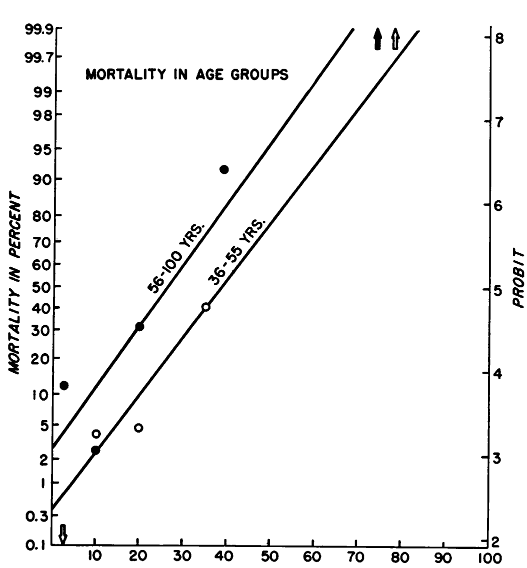

FIG. 5. Regression line of mortality probit on area burned in age groups 36–55 and 56–100 years. $y = 2.33 + 0.0689x$ and $y = 3.08 + 0.0733x$. The open symbols refer to the younger age group. The arrows are explained in the legend of Figure 3.

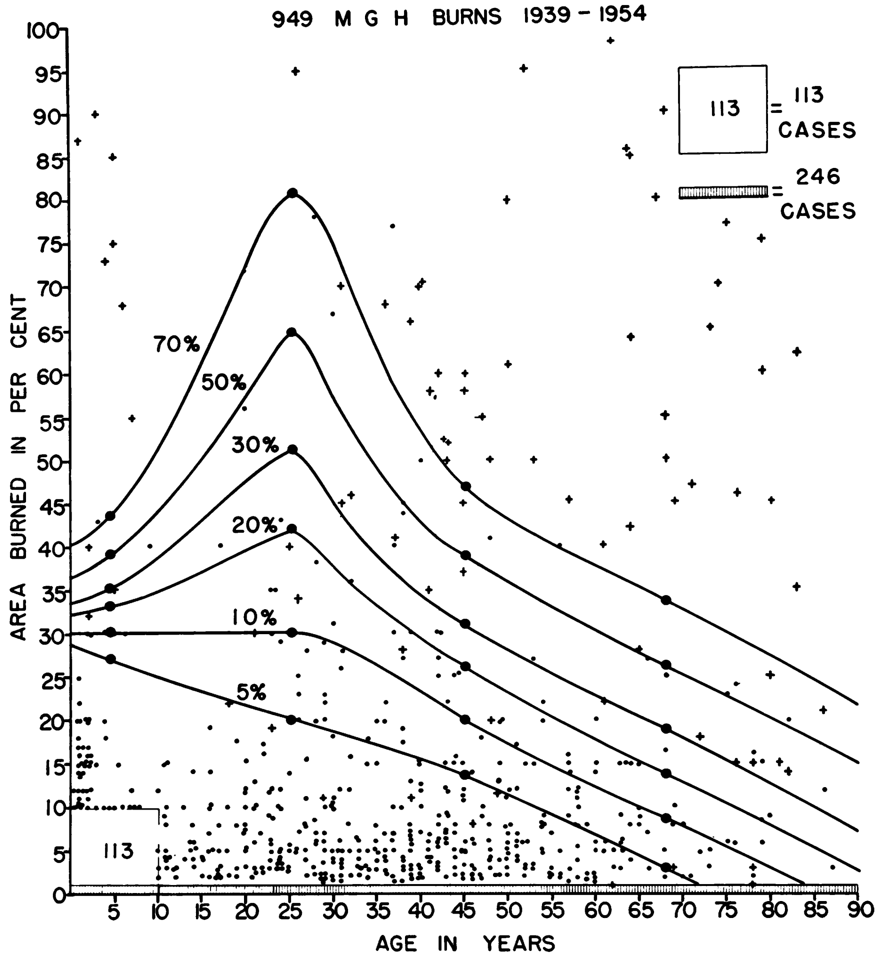

FIG. 6. Distribution of burn cases with mortality contours. This figure is identical to Figure 1 with the additional feature of the mortality contours. The curves connecting the computed points are freehand approximations of the mortality contours.

groups. Table V presents the crude data with the numbers of cases in the three groups of burns divided into the three periods. The standard burn population is defined as one in which the numbers of group I, II, and III burns are in proportion to each other as are the weighting factors displayed in the bottom line of Table V. These factors are derived from the grand totals; i.e. 522/736 = 0.709, etc.

Adjusted Mortality Rates. The overall mortality rate in any one of the three periods is computed by determining the mortality of each group, multiplying by the proper weighting factor, and summing up the adjusted mortalities for the three groups. For example, the mortality of the first period is:

$$\frac{5}{99} \times 0.709 + \frac{3}{20} \times 0.182 + \frac{12}{14} \times 0.109 = 0.156$$

The adjusted mortality rates are presented in Table VI.

The trend of declining mortality from 15.6 per cent in 133 burns in the period of 1939 to 10.5 per cent in 603 burns in the combined periods of 1943–1954, is consist-

TABLE VI. *Mortality Rate in Adjusted Population of Burns*

Year	Number of Burns	Mortality
1939–1942	133	15.6%
1943–1947	248	10.7%
1948–1954	355	10.4%
	—	
	736	
1943–1954	603	10.5%

ent with the clinical impressions concerning the improved therapy available since 1942. However, a strong statistical argument for the validity of the trend is not apparent in these data inasmuch as a test of independence of the two groups of experience with burns indicates a borderline significance ($X^2_{[1]} = 2.83; 0.10 > P > 0.05$). Significantly, the improvement noted in the mortality is shared about equally in burns of all types and is not a characteristic of the more severe and extensive burns. There is no evidence in this study of any definite change in the mortality of burns between 1943 and 1954.

DISCUSSION

Although a somewhat tedious statistical methodology is required in a probit analysis, the mathematical manipulations lead to a comprehensive description of the experience in treating a group of 949 burns. It is possible to draw certain conclusions from the mortality contours displayed in Figure 6. The favorable upward trend of the mortality rates in the second age group is a reflection of the vigor and physiological fitness of individuals in the prime of their life. This group is in the best condition to respond to careful and detailed therapy based on the application of biochemical and physiological principles. It might be argued that the relatively excellent response in this age group is the direct consequence of the youth of the patient. This cannot be accepted entirely because grim past experience in the treatment of burns has been well documented in the years prior to modern therapy, in particular by Weidenfeld.[16] In any event, the lesser resistance revealed by the youngest age group and the two older age groups is in harmony with many examples in medicine where the young and the old succumb to diseases that are withstood by those in the prime of life. This trend is not apparent in the report of Bull and Squire.[2] The 5 per cent mortality contour in Figure 6 descends continuously from the more extensive burns in the lowest age group. It is thought that the relatively good results noted in burns of 25 to 30 per cent extent in the youngest age group in comparison to similar burns in the 16–35 year age group, is a consequence of the younger age group suffering in many instances severe scalds, whereas in the next age group a deeper type of burn with fire and flame produced a more hazardous injury.

The decline in mortality of approximately 5 per cent noted in Table VI, following the introduction in 1943 of adequate intravenous therapy, transfusions, antibiotics, improved methods of aseptic care, greater attention to nutrition, early excision and grafting procedures, etc., is probably a conservative estimate of the improvement; but even if this decline in mortality were, in fact, twice as great, it is clear that the extent of the burn and the age of the patient remain the major considerations in determining the prognosis. In this series of burned patients the advances in therapy since 1942 altered the issue of life and death in less than one case in ten in the overall experience reported, although in selected groups the therapy was obviously of critical importance in permitting survival. This significant salvage of life fully justifies the strenuous efforts made to care for these patients. Modern therapy has doubtless decreased morbidity, discomfort, and complications in burned patients, although meaningful quantification of these less readily defined benefits is difficult. The data have been reviewed in regard to the duration of life following the injury,[18] and this confirms the common clinical impression that today many patients survive the shock phase of acute fluid imbalance by virtue of the vigorous intravenous therapy, only to succumb to sepsis and its complications at a later date. This report does not distinguish between an early and a late death.

SUMMARY

On the basis of experience involving 949 burns, mortality rates have been computed as an aid to evaluating therapy of burns. The various steps in the probit analysis from the crude data to the construction of mortality contour lines have been briefly reviewed. The use of a standard population of burned cases in establishing mortality rate trends has been described. An evaluation of the trend in the mortality rates has indicated a modest reduction in the overall mortality, and this is shared by all burns, not only the more severe ones.

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