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# THE EARNING POWUER OF CANADIAN MALE ANO FEMALE WORYERE, EY AcES. 

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Caution.- This compilation is not intended to serve actuarial purposes. It assembles in a single table a vast mass of facts relating to the vital, the social, the economic and the earning status of the population, in a form in which these statistics have not hitherto been consolidated in Canada, and in which it is considered that they may be especially useful.


Dominion Statistician 。

## THE EARNING POWER OF CANADIAN MALES, BY AGES AND DOMESTIC RESPONSIBILITIES

Gainfully occupied Canadian males numbered 3,261,570 (revised figure) at the date of the census of 1931, out of a total male population of $5,374,541$. These three and a quarter million of gainfully occupied male Canadians were by far the main element among the country's producing population, although in providing for the country's needs they had the assistance of two-thirds of a million gainfully occupied females. Upon the efficiency and the earning power of the three and a quarter millions of Canadian male producers, the current production and therefore, the current income of the Dominion mainly depends. It is they who in the main carry the burdens of the nation.

Gainfully occupied male Canadians as enumerated in the census were divided into four main classes, "wage-earnersi": (including all salaried workers), employers, "workers on own account" and "no pay" assistants, including in the main farmers' sons and others learning their fathers' business. The first was by far the largest class, mumbering at the date of the census $2,022,533$ or approximately 62 per cent of all gainfully occupied males. Of these latter, $1,948,500$ or 59.8 per cent of all gainfully occupied males reported their earnings, being practically three-fifths of all gainfully occupied male Canadians. The earnings figures of these $1,948,500$ Canadian male wage-earners in the twelve month period from June 1, 1930, to May 31, 1931, as stated by the wage earners themselves to the census emumerators, have been taken for the purposes of this bulletin as representative of those of all gainfully occupied Canadian males. While this procedure may be called in question, it is to be remembered; first, that the "wage-earners" are the only persons whose remuneration is either readily ascertainable or is now available; secondly, that "wage-earneris", as defined in the census, include all salaried persons, and therefore include a considerable number of persons with high salaries, such as railway presidents, bank presidents and cabinet ministers. Accordingly, it is felt that these figures as a whole are fairly representative of the earnings of all gainfully occupied Canadian males, whether they are employers or workers on own account, or farmers' sons or others serving what may be described as an apprenticeship to their life work.

For various reasons the statistics of the following table do not give a thoroughly representative picture of the normal earning power of Canadian males. In the first place, the period of observation was the twelve month period prior to June 1, 1931 -- a period which was one of declining earnings and serious unemployment, the male workers of Canada losing an average of 10.78 weeks of work during the twelve months, or over 20 per cent of their potential working time as against not more than 10 per cent in normal times. This naturally had the effect of considerably reducing their money earnings during the year, as compared with what those earnings would have been in normal times, so that all the earnings figures may on this account be considered as lower than normal. Over against this fact, however, may be placed the other fact that money wages have generally been on the down grade in the two and a half years from the end of the period of observation until the present time, while employment has certainly not been more abundant. On this ground it might be claimed that even the showing made in this table is too favourable to be representative. The answer to this criticism, however, is that such a study as this must not be considered as applying to times more subnormal than the already subnormal period on which it is based, and that recent months have shown a substantial measure of recovery towards. the normal, though we are still far below it. Further, while it is recognized that the period of observation was unfortunately subnormal, it is highly improbably that any facilities will be afforded for making a similar study on a better basic period of observation before the census of 1941, which it is hoped will be a more normal year than either 1921 or 1931. For the next eight or nine years, only the 1931 data are
available for our purposes, and whatever their defects may be we must use them or go without this study.

There may be another defect in the study. While the form of its earlier columns suggests that is is a table of the experience of the Canadian-born, its earnings figures are based for each age on the experience of immigrant as well as Canadian-born male wage-earners. Now in 1931 immigrant wage-earners probably tended to suffer more severely from unemployment than native-born Canadians and in any case their earnings were probably on the average lower than those of the Canadian-born workers because of the low grade of work on which a larger proportion of them than of the native-born Canadians is engaged. Yet there would appear to be a proportionately larger number of immigrant wage-earners in urban commuities where money rates of wages are higher than in the country as a whole. Thus, any net downward bias to the figures of earnings on account of immigrant wage-earners is probably of minor importance. In any case, earnings vary widely in the same occupation in different parts of Canada.

Finally, it must be emphasized that this study is based entirely on the census of 1931, and on the earnings of the males of each age who were gainfully employed in the twelve months from June 1930, to May 1931 inclusive. The average boy of say 13 who has just commenced to earn may at age 33 on the average be earning $\$ 1,041$ and at age 53 be earning $\$ 1,169$ if the conditions of 1931 are maintained. But he may be earning more or he may be earning less, with the probability in favour of the former, owing to the natural progress of a country over any long period of time. The present study, however; only gives the actual average earnings of the males who were 33 years of age or 53 years of age in 1931, sind the purchasing power of their earnings must be regarded as based upon the purchásing power of the dollar as it was in 1931. Those who have seen the extraordinary fluctuations in the purchasing power of the dollar in the past twenty years will be wary of making prognostications as to its purchasing power in the future.

## Explanations of the Great Table

The great table which presents the results of the investigation has been prepared in the form of a life table, thus facilitating its application to the individual and his fortunes. It is felt that in this form it is best adapted to practical use, in cluding as it does "expectancy of life", "expectancy of earnings", "expectancy of marriage" and "expectancy of dependent children", data all of which have been compiled on the basis of conditions as they were in 1931, or (in the case of earnings) as they were in the twelve months from June 1930 to May 1931, inclusive. Again it should be noted that the table is Built up from the conditions of 1931; $i_{\circ} e_{0}$, on the assumption that a whole life is passed ander these conditions. It is not to the point that changes in these conditions are expected to take place throughout the lives of those now living. What is desired or at any rate what is possible is to find what kind of a life is to be expected under the conditions of 1931.

The problem to which a solution is attempted in the table is to find for Severy 100,000 persons born, the expectation of occupation, earnings, marriage and achildren under 19 (dependent children) at every stage in life. Nineteen was the earliest age at which, under the conditions of 1931, the person was earning enough to support himself, taking as the criterion the official cost of living figures, though it is true that the earnings of those under 19 may be of material assistance in balancing the family budget.

The table is a compendium of information, a great deal of which needs careful interpretation, but it has the advantage of having a mass of information in fifteen columns which can be studied in an easy chair. Divide any column at any age by 100,000 and you have the chances at birth; by the number of persons living at that age and you have the chances if alive; by column 3 at that age and you have the chances if alive and working and so on. The totals at the foot of the columns are rather difficult to interpret, but If we divide by 100,000 we get the average expectation of life as 59.86 years; of working LIife as 39.29 years; of married life as 27.42 years and so on. If we divide the total of colimen 3 by that of column 2, we have for each eage in column 4 the percentage of the males who are actually working; if we divide column 12 by column 2 we have for each age the: percentage of the male population under consideration, who are married; the thirteenth eolum, gives the number of children under 19 years for each age of the male parent, and the firteenth column gives the average number of dependants on male parents of each age

By dividing each successive column by 100,000 , we obtain also the chances at birth of being in the category described at any age and by dividing by the number of persons at the age wanted we obtain the chances of being in that category if still living. Thus the chances at birth of yearly earnings at 19 is $\$ \overline{3} 12.65$, but if atili alive at 19 the chance is $\$ 368$ while if alive and working it is about $\$ 442$. The chance at birth of being at work at the age of 19 is 70.7 per cent while the chance if alive at that age is about 83.5 per cent. The age of highest earnings for those alive and working is 50 o. At birth the Canadian males chance of total earnings during life is $\$ 37,017$. This allows for his chance of living and working. At birth his chances are 74.42 years of married life (total column 12 divided by 100,000 ) and that he will have 41.59 years of raising one child under 19 years of age or half. of this of raising two children, etc. The age at which the greatest number are marriedis 42 and the age of greatest aggregate earnings is 40 , but when we add wife and children under 19 the age at which the Canadian male has the greatest number of dependents is 41, so that the maximum of earning power and of dependents practically coincide.

Leaving aside the preliminaries and coming to the table itself, it may be noted that various important points are brought out. In the first place, the relation be'ween the total number of persons living and the number gainfully occupied is given at each age from 13 to 91, establishing the age at which Canadian males entered upo their life work and the age at which they left it under the conditions of 1937. It is very significant, for example, that about 11 per cent of our 14 year olds, about 27 per cent of our 15 year olds and about 55 per cent of our 16 year olds are already gainfully occupied. At the other end of the scale it may be noted that over 90 per cent of our males are still gainfully occupied at age 60, about 80 per cent at age 65, about 66 per cent at age 70 , 50 per cent at age 75 , about 35 per cent at age 80 and 20 per cent at age 85 . While those recorded as gainfully occupied at very advanced ages are probably to a large extent farmers who are workers on own account, or employers;, yet the fact that so large a percentage of our gainfully occupied population is of relatively advanced age throws an interesting side-light on such questions as that of old age pensions.

Again, the seventh column establishing the amount of earnings of the gainfully occupied males as at each age is a guide to the earning power of the individual at each age from youth to advanced old age. This calculation has probably never been made with the same degree of fineness in Canada before. It is notable that the period at which the average male person earns $\$ 1,000$ a year or more extends from age 32 to age 62 , while the maximum earnings of $\$ 1,208$ is reached at 50 .

Column nine, "Accumulated Earnings per Person", shows what the average male Canadian just born is likely to earn up to age 91 on the basis of the results of the census of 1931. From this column might be calculated at a specified rate of discount the present worth of a male Canadian baby at birth. But perhaps a more valuable calculation for certain purposes is column eleven, calculated from the total number of 13 year olds, thus avoiding the losses due to infant!mortality. The total earning expectancy of an average Canadian 13 year old boy may, on the basis of the Census of 1931 , be estimated at $\$ 42,957$, being total accumulated earnings divided by 86,183 , the mumber of 13 year old boys left out of the 100,000 born, which figure discounted would give the average present worth of a Canadiant boy of that age. But if a male Canadian lives to age 91, his life's earnings will on the average amount to $\$ 52,377$ and if he lives and works up to that age, they will amount on the average to $\$ 62,135$ 。

The last four columns of the table are concerned with the family responsibilities of gainfully occupied male Canadians for the maintenance of wives and children under 18 .

- These responsibilities would appear to be heaviest at age 42 when $83.5 \mathrm{p}_{\circ} \mathrm{c}$ 。 or about fivesixths of the gainfully occupied male persons are married and the married household has 2.73 children under 18 to support. It is perhaps somewhat of a contradiction in the table that while it shows on the one side that over half our 1.6 year old males and two-thirds of our 17 year old males are gainfully occupied, its thirteenth column goes on the assumption that children under 19 are dependents. This, however, may be in part a recognition of the principle that we expect greater advantages for our children than we have ourselves enjoyed and, secondly, it has to be remembered that the dependent children are of both sexes.

It should be emphasized that while the $\$ 62,135$ given as the total in column 11 represents the average earnings of a boy commencing work at age 13 and working to the extreme old age of 91 , the youth who remains at school to. 16 or 18 ; or goes to university and is graduated at age 22 is likely, except in case of premature death, to earn in a normal life-time more than the boy who comenced work at age 13. In the long run, it is more profitable to spend the earlier years of life in training for the future than to spend them in rendering those classes of service that require little or no preliminary training and can therefore, be undertaken by the boy of 13. Engaging in such work at an early age is apt to mean that the boy remains in a low-wage occupation throughout his working life.
$-4-$
Table IA - Ganada Males: - Out of evéry 100 , 000 persons.
of occupations, earnings endeependents,

born alive, number living at completed age $x$; also expectations under the conditions of 1931.

| ** | Accumulated Earnings | Accumu- <br> lated <br> earn <br> ings <br> per <br> person | Accuma. <br> lated <br> earn- <br> ings <br> per <br> person <br> living | Accumu <br> lated <br> earnings <br> per person <br> living and <br> working <br> up to <br> age $x$ | Number Married | Number <br> of <br> children <br> 0-18 | Total <br> Number <br> of <br> depend- <br> ents | Dependents per person |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | $78$ | \$(9) | あ(10) |  | (12) | (13) | (14) | (15) |
|  |  |  |  | \% |  |  | $\cdots$ |  |
| , |  | $\cdots$ | - | - - | - | - | - | $\cdots$ |
|  |  | - | $\cdots$ | $\cdots$ |  |  |  |  |
|  | 546,885 | 5 | 6 | 135 | $\sim$ | - |  |  |
| H | 2,265,705 | 23 | 26 | ) 315 | $\cdots$ | - |  |  |
|  | 7,423,605 | 74 | 86 | 品 540 | - | $\cdots$ |  |  |
|  | 20,141,145 | 201 | 235 | 810 |  | - | + |  |
|  | 38,327,355 | 383 | 448 | $\because 1,125$ | 390 | 30 | - 420 | . 0049 |
|  | 63,666,284 | 637 | 746 | $\cdots 1,496$ | 834 | 208 | - 1,042 | . 0122 |
|  | 94,931,596 | 949 | 1,11.4 | - .1,938 | 3,396 | 795 | -4,191 | . 0494 |
|  | 1.32,034,046 | 1,320 | 1,552 | - 2,444 | 5,740 | 2,173 | - 7,913 | . 0935 |
|  | 174,607,775 | 1,746 | 2,056 | 3,005 | 8,695 | 4,851 | 13,546 | . 1605 |
|  | 222,559,063 | 2,226 | 2,626 | 3,621 | 11,950 | 9,106 | 21,056 | . 2502 |
|  | 273, 327,313 | 2,733 | 3,231 | 4,271 | 18,037 | 15,388 | 33,425 | . 3984 |
|  | 326,277,688 | 3,263 | 3,864 | 4,946 | 23,835 | 23,085 | 46,920 | . 5610 |
|  | 382,470,202 | 3;825 | 4,538 | 5,660 | 29,263 | 31,956 | 61,219 | . 7343 |
| $b$ | 441,984, 310 | 4,420 | 5,254 | 6,413 | 34,324 | 41, 767 | 76,091 | . 9156 |
|  | 504,854,936 | 5,048 | 6,013 | 7,206 | 39,102 | 52,315 | 91,417 | 1.1035 |
|  | 571, 094,263 | 5,711 | 6,815 | 8,039 | 43,269 | 63,608 | 106,877 | 1.2943 |
|  | 641,420,969 | 6,414 | 7,670 | 8,920 | 47,1.55 | 74,818 | 121,973 | 1.4821 |
|  | 715,055,929 | 7,150 | 8,568 | 9,840 | 50,680 | 85,938 | 136,618 | 1. 6660 |
| \% | 792, 173, 212 | 7,921 | 9,512 | 10,807 | 53,847 | 97,043 | 150,890 | 1.8467 |
|  | 871,626, 21.2 | 8,716 | 10,488 | 11,807 | 56, 741 | 107,831 | 164,572 | 2.0216 |
|  | 954,020, 31.6 | $\mathrm{9}^{9} 540$ | 11,9504 | 12,848 | 58,388 | 118,426 | 176,814 | 2.1803 |
|  | 1,036,425,910 | 10,364 | 12,524 | 13,893 | 59,776 | 128,769 | 188,545 | 2.3341 |
|  | 1,119, 741,996 | 11,9198 | $1.3,560$ | 14,954 | 60,955 | 137,665 | 198,620 | 2.4686 |
| ". | 1,203,895,956 | 12,039 | 14,610 | 16,030 | 62,263 | 146,465 | 208,728 | 2.6048 |
|  | 1,290,584, 187 | 12,906 | 1.5,696 | 17,143 | 62,565 | 154,831 | 217,396 | 2.7242 |
|  | 1, $378,290,975$ | 13,783 | 16,800 | 18,274 | 62,769 | 161,971 | 224,740 | 2.8285 |
| - | 1,467,753,026 | 14, 678 | 17,931 | 19,433 | 62,953 | 168,075 | 231,028 | 2.9212 |
|  | 1., $558,777,616$ | 15, 588 | 19,088 | 20,618 | 63,120 | 171,572 | 234,692 | 2.9820 |
|  | 1,649, 477,852 | 16,495 | 20,246 | 21,806 | 63,270 | 173,401 | 236,671 | 3.0225 |
|  | 1,739, 902,972 | 17, 399 | 21, 407 | 22,998 | 63,320 | 173,043 | 236,363 | 3.0348 |
|  | 1,829,947,417 | 18,230 | 22,570 | 24,193 | 63,038 | 170,55? | 233,595 | 3.0164 |
|  | $1,919,420,177$ | 19,194 | 23,732 | 25,389 | 62,727 | 166,335 | 229, 062 | 2.9762 |
| ! | $2,008,11.5,537$ | 20, 081 | 24,892 | 26,585 | 62,386 | 159,922 | 222,308 | 2.9077 |
|  | 2,096,096,885 | 20,961 | 26, 051 | 27,781 | 62,124 | 152,600 | 214,724 | 2.8284 |
|  | 2, 183, 463, 431 | 21,835 | 27,211 | 28,979 | 61,635 | 144,141 | 205,776 | 2.7310 |
|  | 2,270, 271, 711 | 22,703 | 28,372 | 30,180 | 60,994 | 135,203 | 196,197 | 2.6248 |
|  | 2,356,543,686 | 23, 571 | 29,536 | 31,385 | 60,330 | 126,006 | 186,336 | 2.5141 |
|  | 2,442,165,518 | 24,427 | 30,702 | 32,593 | 59,641 | 116,105 | 175,746 | 2.3927 |

Table IA - Canada Males: - Out of every 100,000 persons of occupations, earnings and dependents,

57.003

TOTAL $5,985,696$ 3,928,898 yrs. 3,702,156,264 52,377 62,135
born alive, number living at completed age $\mathbf{x}$; also expectations under the conditions of 1931 - Concluded.


# $-8=$ <br> THE EARNING POWER OF CANADIAN FEMALE WORKERS, BY AGES AND <br> PERCENTAGES OF FEMALES WORKING AT EACH AGE 

Gainfully occupied Canadian females numbered 666,021 at the Census of 1931, out of a total female population of $5,002,245$, of whom $1 ., 419,529$ were under 13 years of age, leaving 3,582, 716 above that age。

The 666,021 gainfully occupied Canadian females recorded at the census were divided into four main classes, "wage-earners" (including all salaried workers), "employers", "workers on own account" and "no pay assistants"。 The first class was by far the largest, including over 82 per cent of the total number. Of these, 528,538 reported their earnings, being 79.4 per cent of all gainfully occupied females. The earnings figures of these 528,538 have been taken as representing for the purposes of this bulletin the earnings of all gainfully occupied females. In this connection it is to be remembered firstf that it is only the wage earners whose earnings are available, and secondly, that the term "wage-earner", as used in the census, includes all salary earners, among them a considerable number of comparatively highly paid workers. Thus it is felt that the figures are fairly representative of the remuneration of all gainfully occupied females in the period covered by the statistics.

The statistics of the following table, however, do not necessarily give a thoroughly representative picture of the normel earning power of Canadian female workers. In the first place, the period of observation was from June 1, 1930 to May 31, 1931 -... a twelve month period when unemployment was larger than usual, though this affected female workers less than male workers. In these twelve months the average female wage earner worked only 46.59 weeks and lost 5.41 weeks or rather over 10 per cent of her potential working time. Thus her earnings in this period were presumably less than normal., yet the experience: of the succeeding two and a half years is certainly more unfavourable still, so that the experience in the twelve months prior to the census may be considered as representative of conditions prevailing over a conslderable period.

Considering the table, it may be noted first that at no age were the gainfully occupied females one half of the total number of females of that age. The maximum proportion of the gainfully occupied females to the total was reached at/age 20, when 48.4 per cent of all females were gainfully occupied, while at ages 19 and 21 between 44 and 45 per cent, of four out of every nine females were gainfully occupied. At 22, again, over 40 per cent of all females were gainfully occupied, but thereafter the proportion declined rapidly, doubtless mainly owing to marriages. By age 25, the proportion of gainfully
occupied females was reduced to less than one-third ( 32.6 p.c.), by age 28 to less than one-quarter ( $24.5 \mathrm{p}, \mathrm{c}_{0}$ ), and by age 30 to less than one-fifth (19.1 poco). By age 34 the proportion of gainfully occupied females to total had fallen to less than one-eighth or 12.2 poc., and except for a slight increase to 13.2 poc. at age 39, (apparently due in some degree to widows returning to gainful occupation), it remained between 12 and 13 p.c. to age 46, and between 11 and 12 poc. up to age 58 , and between 10 and 11 poc.up to age 63. Thereafter the percentage of gainfully occupied females to the total shows distinct declines at each year of age, falling to 7.0 p.c. at age 70 and 5.8 poc. at age 75. From these figures it would appear that after 34 marriage takes a comparatively small number of women out of the labour market. Indeed, early marriage may result in putting back into the labour market later on a considerable number of females - possibly as many as marriage after 34 takes out. Again, it may provide them with dependentsan invalid husband or minor children. Widowhood, too, may result in putting many women back into the labour market, whether it be with or without dependents.

Looking at the table, it becomes evident that the so-called emancipation of women is very partial. Leaving aside those under twelve, and also leaving out of account those who may be independent as a result of income derived from property, it appears that only about 15.5 p.c. of those over 12 are self-sustaining. For a few brief years from 19 to 22 between 40 and 50 per cent of our young women are self-sustaining and making nearly as much money as their brothers of the same ages. But as they go on they either get married or fall behind their brothers in remuneration.

The wage rates of women workers are in the main much less than those of men in similar positions, perhaps because a small proportion of women workers become more than routine workers. For a few brief years between 37 and 43 the average women worker, who by that time is probably wedded to her work, gets a remuneration of over $\$ 750$, reaching a maximum of $\$ 759$ at 40 years of age. From ages 31 to 49 her average remuneration exceeds $\$ 700$ and from 25 to 58 it exceeds $\$ 600$ and by 64 it falls under $\$ 500$.

Table IB - Canada Females: - Out of every 100,000 of occupations and earhis

| Complete age x (except o) | Persons | Number gainfully occupied | P.C. gainfully occupied | Total earnings at age $x$ |  |
| :---: | :---: | :---: | :---: | :---: | :---: |
| (I) | (2) | (3) | (4) | (5) | (6) |
| 0 | 100,000 |  |  |  | \% |
| 0-12 | 1,166,752 |  |  |  |  |
| 13 | 88,526 | 442 | 0.5 | 29,614 | 0 |
| 14 | 88,368 | 1,679 | 1.9 | 209,875 | 2 |
| 15 | 88,183 | 5,203 | 5:9 | 946,946 | 11 |
| 16 | 87,978 | 13,461 - | 15.3 | 3,203,718 | 36 |
| 17 | 87,760 | 24,310 | 27.7 | 7,122;830 | 81 |
| 18 | 87,531 | 32,999 | 37.7 | 11,450,653 | 131 |
| 19 | 87,297 | 39,196 | 44.9 | 15,678,400 | 180 |
| 20 | 87,057 | 42,136 | 48.4 | 18,919,064 | 234 |
| 21 | 86,809 | 38,543 | 44.4 | 19,040,242 | 219 |
| 22 | 86,550 | 35,312 | 40.8 | 18,856,608 | 218 |
| 23 | 86,282 | 32,528 | 37.7 | 18,915,680 | 211 |
| 24 | 86,004 | 29,671 | 34.5 | 17,357,535 | 202 |
| 25 | 85,713 | 27,942 | 32.6 | 16,988,736 | 198 |
| 26 | 85,410 | 25,708 | 30.1 . | 16,170,332 | 189 |
| 27 | 85,094 | 23,316 | 27.4 | 15,132,084 | 179 |
| 28 | 84,769 | 20,768 | 24.5 | 13,852,256 | 163 |
| 29 | 84,435 | 18,238 | 21.6 | 12,456,554 | 148 |
| 30 | 84;093 | 16,062 | 19.1 | 11,211,276 | 133 |
| 31 | 83,733 | 14,318 | 17.1 | 10,165,780 | 121 |
| 32 | 83,370 | 12,756 | 15.3 | 9,184,320 | 110 |
| 33 | 83,001 | 11,205 | 13.5 | 8,168,445 | 98 |
| 34 | 82,634 | 10,080 | 12.2 | 7,428,960 | 90 |
| 35 | 82,271 | 10,037 | 12.2 | 7,467,528 | 91 |
| 36 | 81,912 | 9,905 | 12.2 | 7,418,845 | 91 |
| 37 | 81,550 | 10,063 | 12.4 | 7,587,502 | 93 |
| 38 | 81,177 | 10,140 | 12.5 | 7,675,980 | 95 |
| 39 | 80,791 | 10,664 | 13.2 | 8,083,312 | 100 |
| 40 | 80,39]. | 10,370 | 12.9 | 7,870,830 | 98 |
| 41 | 79,883 | 10,145 | 12.7 | 7,679,765 | 96 |
| 42 | 79,562 | 9,945 | 12.5 | 7,508,475 | 94 |
| 43 | 79,124 | 9,811 | 12.4 | 7,387,683 | 93 |
| 44 | 78,670 | 9,676 | 12.3 | 7,247,324 | 92 |
| 45 | 78,196 | 9,462 | 12.1 | 7,039, 728 | 90 |
| 46 | 77,711 | 9,325 | 12.0 | 6,872,525 | 88 |
| 47 | 77,201 | 9,110 | 11.8 | 6,641,190 | 86 |
| 48 | 76,665 | 9,046 | 11.7 | 6,513,120 | 84 |
| 49 | 76,098 | 8,751. | 11.5 | 6,213,210 | 82 |
| 50 | 75,501 | 8,607 | 11.4 | 6,007,686 | 80 |
| 51 | 74,875 | 8,386 | 11.2 | 5,777,954 | 77 |
| 52 | 74,215 | 8,237 | 11.1 | 5,601,160 | 75 |
| 53 | 73,505 | 8,159 | 11.1 | 5,458,371 | 74 |

born alive, number living at completed age x , also expectations under the conditions of 1931.


## (7) <br> (8)

## (9)

(10)
29,614
239,489
$1,186,435$
$4,390,153$
$11,512,983$
$22,963,636$
$38,642,036$
$57,561,100$
$76,601,342$
$95,457,950$
$113,673,630$
$131,031,165$
$148,019,901$
$164,190,233$
$179,322,317$
$193,174,573$
$205,631,127$
$216,842,403$
$227,008,183$
$236,192,503$
$244,360,948$
$251,789,908$
$259,257,436$
$266,676,281$
$274,263,783$
$281,939,763$
$290,023,075$
$297,893,905$
$305,573,670$
$313,082,145$
$320,469,828$
$327,717,152$
$334,756,880$
$341,629,405$
$348,270,595$
$354,783,715$
$360,996,925$
$367,004,611$
$372,782,565$
$378,383,725$
$383,842,096$

| - | - . | 67 |
| :---: | :---: | :---: |
| 2 | 2 | 192 |
| 12 | 13 | 374 |
| 44 | 49 | 612 |
| 115 | 130 | 905 |
| 230 | 261 | 1,252 |
| 386 | 441 | 1,652 |
| 576 | 675 | 2,101 |
| 766 | 894 | 2,595 |
| 954 | 1,112 | 3,129 |
| 1,137 | 1,323 | 3,689 |
| 1,310 | 1,525 | 4,274 |
| 1,480 | 1, 723 | 4,882 |
| 1,642 | 1,912 | 5,511 |
| 1,793 | 2,091 | 6,160 |
| 1,932 | 2,254 | 6,827 |
| 2,056 | 2,402 | 7,510 |
| 2,168 | 2,535 | 8,208 |
| 2,270 | 2,656 | 8,918 |
| 2,362 | 2,766 | 9,638 |
| 2,444 | 2,864 | 10,367 |
| 2,518 | 2,954 | 11,104 |
| 2,593 | 3,045 | 11,848 |
| 2,667 | 3,136: | 12,597 |
| 2,743 | 3,229 | 13,351 |
| 2,819 | 3,324 | 14,108 |
| 2,900 | 3,424. | 14,866 |
| 2,979 | 3,522 | 15,625 |
| 3,056 | 3,618 | 16,382 |
| 3,131 | 3,712 | 17,137 |
| 3,205 | 3,805 | 17,890 |
| 3,277 | 3,897 | 18,639 |
| 3,348 | 3,987 | 19,383 |
| 3,416 | 4,075 | 20,120 |
| 3,483 | 4,161 | 20,849 |
| 3,548 | 4,245 | 21,569 |
| 3,610 | 4,327 | 22,279 |
| 3,670 | 4,407 | 22,977 |
| 3,728 | 4,484 | 23,666 |
| 3,784 | 4,559 | 24,346 |
| 3,838 | 4,633 | 25,015 |



born alive, number living at completed age $x$, also expectations the conditions of 1931 = Concluded.

Earnings
per person living Accumulated and working at age $x$
-

Appendix．－Basic Principles Underlying the Construction of Tables $I_{0}$ and II。

The foregoing tables must not be given more weight than they claim for themselves．．They deal with aggregates only and can never be used to apply to particular individuals．The same is true of any aggregate．Thus it is no more sound to argue that if a John Brown is killed at the age of 37 the world is deprived of $\$ 24,000$ of earnings than to argue that because the average height of men of his race is $5^{\prime} 7^{\prime \prime}$ ，John Brown wears a size 7 shoe．Averages must not be used as proofs with regard to any in－ dividual；they are merely guides or standards to which to refer what is actually as：－ certained about that individual．But where groups of individuals are considered，the larger the group the greater is the likelihood of substantial conformity with the average of all the individuals under consideration．

An enormous amount of preliminary calculation was made before the cal－ culation of Table I．was undertaken，particularly with reference to the four following questions：－

1．Would such a table apply truthfully to a particular individual？
2．Would it apply truthfully to the aggregate population？
3．Would it apply truthfully to the chance individual：$\underline{i}_{0} e_{0}$ a person picked out of that population at random？
4．Would it apply truthfully to any other period than that for which it was calculated，viz．，the year ended June 1，1931？
1.

The answer to the first question is a decided No．It should never be used to apply to a particular individual even on a priori grounds，apart from the nature of the data with which it deals．The tremendous difference in the capacities of in－ dividuals has been established so firmly that it should not be necessary to introduce the caution that the data of this table should not be used to apply to a particular individual．Apart from these a priori grounds，the data on unemployment and earnings bear marks of a personal equation in the answers to the census enumerator that is even more decided than in answers with reference to certain other attributes－say age； e．g．，it may be mentioned that when A is asked how many weeks he was idle he is more apt to say 6 than either 5 or 7。 The preference for round numbers is very pronounced in data of employment．Efforts were made to ascertain whether this was due to un－ familiarity with figures（the data used being the employment figures of 1921）．It so happened that actuaries，accountants，teachers，etc．，showed this tendency to a more pronounced degree than unskilled labourers．However，such a tendency cancels out in an aggregate，but the point illustrates the danger of applying the results of averages to individuals．

2 。
Does it apply truthfully to an aggregate population？The answer to this depends upon（a）the truthfulness of the raw data；（b）the precision with which certain operations were performed，such as graduating the age－groups in which the data were given into single years，and（c）the uses for which the material is desired．

To dispose of（b）first，no serious error can arise from the difference between the method used in graduating and any good method．So far as possible，con－ ventional methods were used．The population was smoothed for the purpose of a life table by conventional methods．The age groups for which the number of persons gain fully occupied and earnings were given were graduated by the method of differences．

Throughout the great part of the age range the figures fell into such logical arrangement that there was no great difficulty. The greatest difficulty in such graduation is nearly always at the two extremes, but it will be readily seen that phile this applies in a life table where the most difficult place of all is where the largest numbers occur, viz., ages under 5 , the numbers in employment and earnings figures are so small at the extremes that a slight error would not appreciably affect the main results. Care was taken throughout that when earnings were graduated by single years and workers similarly graduated, the earnings multiplied by the workers for each year totalled the same for the age-groups appearing in the Census as the total earnings of these groups in the Census. This is regarded as a sufficient guarantee for the adequacy of the method used. Further, at the extreme early ages of employment the single years were given by the Census, so that one source of difficulty was thereby removed. At the other extreme the ages were carried on until the workers, graduated by fourth differences, disappeared. In the case of men this was the age of 92 ; in the case of women 79. The earnings, etc., were governed accordingly. However, it would make practically no difference to the significance of the table whether the workers were killed off at 92 or at, say, 85; the numbers, earnings, etc., at these ages are practically insignificant.

The accuracy of the raw data was made a subject of a rather long study in connection with the Census of 1921. The conclusion then was, that, as applied to averages rather than individuals, the Census data of employment and earnings have a satisfactory degree of accuracy with reference to number employed on June 1; period worked during the year, divided into week groups; and yearly earnings. To investigate the accuracy of the data on earnings a number of cities were taken where the wage rate per hour of different occupations and the number of hours worked during the week were reported by the Labour Gazette. A calculation was made of the yearly earnings of 1920-21 in these cities on the basis of the time worked during the year reported by the Census of 1921 was compared.with the earnings reported by the Census. The following table shows the results for the city of Toronto. It will be seen that, considering the differences in the source of the data, the incidence of such factors as part-time employment and over-time employment; the fact that certain persons with a given occupation on June l, might have worked part of the year at another occupation and other difficulties, the correlation between the calculated and the recorded figures is very close. This could not conceivably happen unless the two were measuring the same thingo

Table A - Earnings of Males, Ages 25.49 in Toronto, 1921, Compared with Average Weeks Fmployed. Wage Rate Per Hour and Hours Per Week on Schedule

| Occupation | 1 <br> Average earnings | 2 <br> Average weeks | $\begin{aligned} & 3 \\ & \text { Hourly } \\ & \text { rate } \end{aligned}$ | 4 <br> Hours per week | Earnings as calculated from $2,3 \text { and } 4$ | Error |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| I. Bricklayers (Constr.) | \$ 1,119 | 37.6 | 100 | 44 | \$ 1,068 | \$ 51 |  |
| 2. Carpenters (Constr.) | 1. 1.53 | 41.3 | 90 | 44 | 1,172 | --19 |  |
| 3. Electric workers (Constro) | 1,295 | 45.8 | 873 | 44 | 1,400 | 1.05 | s* |
| 4. Painters (Constre) | 18084 | 42.7 | 75 | 44 | 12101 | -17 |  |
| 5. Plasters (Constro) | 1,071 | 38.0 | 100 | 44 | 1,089 | $\cdots$ |  |
| 6. Plumbers (Constr.) ! | 1,236 | 43.4 | 90 | 44 | 1,288 | $-52$ |  |
| 7. Sheet metal (Constr.) | 1,104 | 39.7 | 90 | 44 | 1,084 | 20 |  |
| 8. Stone cutters (Constro) | 1,119 | 37.6 | 1.00 | 44 | 1,068 | 51. |  |
| 9: Labourers (Constr.) | 820 | 38.7 | 60 | 52 | 814 | 6 |  |
| 10. Blacksmiths (Iron and Steel | 1,114 | 44.1 | $70 \frac{1}{2}$ | 49 | 1.189 | -45 |  |
| 11. Boiler makers (Iron and Steel) | 1., 198 | 43.4 | 83 | 46 | 1,239 | - 41 |  |
| 12. Machinists (Iron and Steel) | 1,220 | 44.8 | $63 \frac{1}{2}$ | 47 | 1,138 | 82 |  |
| 13. Iron moulders (Iron and Steel) | 1,092 | 41.1 | 75 | 49 | 1,064 | 28 |  |
| 14. Compositors (Printing \& Bookbinding) | ) 1,520 | 48.5 | 79 | 48 | 1,500 | 20 |  |
| 15. Pressmen (Printing and Bookbinding) | 1.935 | 47.4 | 75 | 48 | 1,400 | 35 |  |
| 16. Bookbinders (Printing \& Bookbinding) | ) 1,425 | 46.3 | $76{ }^{\frac{1}{2}}$ | 46 | 1,339 | 86 |  |
| 17. Conductors (Street railways) | 1,325 | 49.8 | 60 | 48 | 1,383 | -58 |  |
| 18. Linemen (Transportation) | 1.4171 | 48.8 | 65 | 48 | 1,378 | 93 |  |
| 19. Shedmen (Street Railways) | 1,295 | 49.4 | $52 \frac{1}{2}$ | 48 | 1.292 | 3 |  |
| 20. Electricians (Street Railways) | 1,441 | 49.6 | $52 \frac{1}{2}$ | 48 | 1,304 | 137 |  |
| 2I. Trackmen \& Lab。 (Street Railways) | 1,116 | 48,5 | 54 | 48 | 1,252 | -136 |  |
| 22, Labourers (Civic) | 1,138 | 45.6 | 60 | 44 | 1,112 | 26 |  |
| 23. Firemen (Civic) | 1.581. | 51.4 | 481 ${ }^{1}$ | 72 | 1,606 | -25 |  |
| 24. Policemen (Civic) | 1,648 | 50.5 | 78 | 48 | 1,600 | 48 |  |
| 25. Teamsters (Transportation) | 1,187 | 48.3 | 48 | $54 \frac{1}{4}$ | 1,254 | -67. |  |
| Average | \$ 1 , 236 | 44.6 | 74 | 47 | \$1,245 | $\cdots$ |  |

$$
\text { Equation } X_{1}=54.94 X_{2} \neq 9.89 \mathrm{X}_{3} \nvdash 10.16 \mathrm{X}_{4}-2433.70
$$

3. The third question is "Does it truthfully apply to the chance individual?" i.e., if a person is picked out at random from the population are the facts of the table more likely to apply to this person than any other facts referring to the same subject? This Is, undoubtedly, the most important of the three questions, and if the answer is in the affirmative it is as far as statistical analysis professes to $\mathrm{go}_{\mathrm{g}}$ since we always have to regard the prediction value of statistics with suspicion.

The answer to this question depends upon the general behaviour of employment data and a great deal of preliminary study was given to this behaviour; ioe.the behaviour around the average. The question resolves itself into another question is the average apt to be more representative than any other single fact in employment and earning data? Con ceivably it might not be. Thus if out of 100 men, 10 earned $\$ 600$ a year; 10 earned $\$ 700$; 10 earned $\$ 800$ and so on, the average would be $\$ 1050$ but clearly this figure would not be more representative than $\$ 600$ or $\$ 700$, etc。 If, however, the largest number got $\$ 1050$ and a smaller number got something close to $\$ 1050$, above and below it; a still smaller number got a sum a little further from $\$ 1050$ and so on; then $\$ 1050$ would be representative because it was the most probably single figure while any other single figure would be tied dow to a certain distance from $\$ 1.050$.

Now if in the nature of employment data the facts wander all over and there is no central tendency, then no table, however carefully prepared, would represent the chances of the individual, and the only way to know whether this is so or not is by a very intensive and extensive study of the data. We are faced by the variability in the rate of individual wages even in the same occupation; in the time lost during the year; in the differences between occupations; in the differences between industries and localities; by seasonal fluctuations; by ages of workers, sex, etc. The age factors are taken care of in the table and they are the most important. It remained to test the others. Particular attention was paid to the time lost during the year, seasonal changes, occupational differences and localities. In connection with the Census of 1921., a hundred occupations or sub-classes of industries were selected for the whole of Canada; i.e. all the sub-classes having sufficient numbers of employees to give reliable reaults. These occupations were studied individually for the behaviour of the number of weeks lost during the year arranged in frequencies such as "Number losing no time; losing l-4 weeks; $5-8$ weeks, etc." The conclusion was that these frequencies show greater fidelity to normal frequency than is usually found in statistical data. Perhaps the most significant fact shown is that in the individual occupations as well as the aggregate of occupations, the majority lose no time, while the remainder cling desperately to this ideal. The difference between an occupation that loses a great deal of time and one that loses little time was generally due to the fact that the gradually diminishing numbers lost more weeks in one occupation than in another; i.e., suppose an occupation of 100 men and that 60 lost no time; 20 lost $1-4$ weeks; 10 lost $5-8$ weeks; 5 lost $9-12$ weeks and so on until the 100 were exhausted. Another occupation also of 100 men , might lose more time than this, but the number losing no time might be very close to the 60, while the proportions losing time might gradually diminish according to the number of weeks lost, so that the average loss might be comparatively small. The difference between the two consists mainly in the fact that in the better occupations the higher week intervals would have few or none, while in the worse off the time lost would be spread all over the year. Thus the worse occupations would have, a number losing 52 weeks while the better would not. The greatest part of the total weeks lost would be lost by the extremes involving the smallest fraction of the total number of workers. It is clearly a different case when 100 men lose 600 weeks, each man losing 6 weeks and when the 100 men lose 600 weeks but 60 of them lose no time; 30 lose 4 weeks on an average; 20 lose on an average 24 weeks.

Thus there seems to be an unusual number of factors in time lost from work that remain constant, while the variables involve smaller numbers of persons, the greater the variable. The same law that connects the individuals of any occupations also connects the different occupations. Thus between one extreme like longshoremen and the other like bank managers the 100 occupations were capable of being arranged in a normal series. All seemed to be tied down to a common centre.

The same normal frequencies were observed in the reports of firms from month to month throughout the ten years from 1921 to 1931. An attempt was made in connection with the Census of 1931 to measure the influence of localities in the matter of yearly earnings according to the weeks worked. In this case forty selected occupations were taken in each of the nine provinces, and the balance of the occupations were combined into a group in each province, except that a few groups that were very small were combined with others, giving a total of 363 occupation groups for the Dominion. The results are show in the following table where the average earnings of the 363 occupation groups according to the number of weeks worked are show. The influence of localities was removed in the following manner. The weekly rate of each occupation was expressed, not in dollars, but as multiples of the weekly rate for unskilled labour in each province. The earnings are shown in dollars in the table below, merely to save confusion, having been translated back to dollars by multiplying the number of labour weeks ascertained by the average labour week rate for Canada. It will be readily seen that this vas not necessary, and that it did not affect the arrangement of the groups in the table. The important feature of the table is the behaviour of the groups around the average or averages. The central tendency is unmistakable.

TABLE B. - Average yearly earnings and average weeks of work of male wage-earners in forty in each group, ranged by average number of weeks worked by each group in wage scale prevailing

Note ${ }_{0}$ The original data of this table were

| Number of occupation groups consideredx |  | verage rnings each upation roup rvale\$66 | $\begin{gathered} 26 \\ \text { and } \\ \text { under } \end{gathered}$ | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | A |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| : |  | \$ |  |  |  |  |  |  |  |  |  |  |  |  |  |
| 8 |  | 2376 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| $\therefore 2$ |  | 2310 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 2 |  | 2244 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 1 | .. | 2178 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 1 |  | 2112 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 2 |  | 2046 | - | - | - | - | - | $\div$ | - | - | - | - | - | - |  |
| $\begin{array}{r}3 \\ \hline\end{array}$ |  | 1980 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| - 2 |  | 1914 | $\cdots$ | - | - | - | - | - | - | - | - | - | - | - |  |
| $\therefore$ |  | 1848 | - | - | $\cdots$ | - | - . | . - | - | - | - | - | - | - |  |
| 5 3 |  | 1782 1716 | - | - | - | $=$ | - | - | - | - | - | $\square$ | - | $\square$ |  |
| 4 |  | 1650 | $=$ | - | $\pm$ | - | $=$ | - | - | - | - | - | - | - |  |
| - 3 |  | 1584 | - | - | - | - | - | - | - | - | - | - | - | $\bigcirc$ |  |
| 8 |  | 1518 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 10 |  | 1452 | - | - | - | - | - | - | $\bigcirc$ | - | - | - | $\cdots$ | $\bigcirc$ |  |
| 12 |  | 1386 | - | - | - | - | - | - | - | - | - | - | - | 510 |  |
| 11 |  | 1320 | - | - | - | - | - | - | - | - | $\bigcirc$ | - | - | - |  |
| 17 |  | 1254 | - | - | - | - | - | - | - | - | - | - | - | - |  |
| 20 |  | 1188 | - | - | - | - | - | - | - | - | - | - | - | 304 |  |
| 20 |  | 1122 | - | - | - | - | - | $\cdots$ | - | - | - | - | 234 | 554 |  |
| 29 |  | 1056 | - | - | $\cdots$ | - | - | $\cdots$ | - | - 29 | - | -* | - 641 | 731 |  |
| 22 |  | 990 | - | - | $\cdots$ | - | - | - | - | 358 | - 583 | 3 - | - 133 | 1,765 |  |
| 29 |  | 924 | - | - | - | - | - |  | - | - | - 78 | - 480 | 133 | 502 |  |
| 38 |  | 858 | - | - | - | - | 482 | - | 4,524 | - | 78 | $8 \quad 146$ | 999 | 395 |  |
| 29 35 |  | 792 | 270 | 252 | - | - | 7,999 | - - | 4.734 | 2,136 | -184 | 4 - | 12,463 | 425 |  |
| 35 16 |  | 726 660 | + 420 | 29 | 6,284 | 10 |  | 10,328 | 767 | 1,542 | 20,923 | 310,028 | 840 | 65 |  |
| 16 |  | 660 594 | 1,020 | - | 5,474 | 10 | 2,870 | - | 2,384 | 14 | 4 - | 1,134 | - | - |  |
| - 2 |  | 594 528 | 318 | - | 2,906 | -188 | - | - | 7,044 | - | - | - | 15 | 5,133 |  |
| 8 |  | 462 | - | - | - | 39,197 |  | 15,983 | - | 138,357 | 7149,391 | 19,911 | - | - |  |
| 4 |  | 396 | 101 | - | - | 25,320 | - | 17,149 | - | - | - | - | - | - |  |
| 4 | Under | 396 | 28 | - | - | - | - | - | - | - | - | - | - | - | - |

Total 2,177 $28114,66464,71511,68343,46019,653142,436171,15931,69915,325110,384$

Total 363 $\qquad$
cupation groups
represented
$13 \quad 2$
$4 \quad 4 \quad 6$
5
976

DATE DUE

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