BIRTH-INTERVALS ACCORDING
TO
BIRTH-ORDERS

A Research from the result of
Investigation on fertility surveyed in 1940

by
DR AYANORI OKASAKI

STUDIES IN BIRTH-INTERVALS ACCORDING TO BRITH-ORDERS

I

A report of researches for birth-power was made in 1940, January, by the Research Institute of Population Problem in the Ministry of (Health and Social) Welfare. That was a specimen-research, but cases investigated were remarkably many, compared with researches which had previously been made, investigation-cards cellected amounting to as many as 80,638 and those available, 71,606. As I prepared tables from the results of investigation and tried some comments upon them, I know very well that it was far from satisfaction, and yet I believe it has certainly been something worthwhile as reference materials for those students interested in this problem.

My comments are found in one of my papers titled, "An Outline of the Results of Investigation in Birth-Power", which was published in "Studies in Population Problems", Vol.I.No.7(1940, October). In it a statistical observation was made for birth-intervals according to birth-orders by extracting 12,349 first-married couples whose conception-period had already been due. Average birth-intervals were investigated in it by joining together prolific and unprolific couples. As pointed out by Pro. Mizushima in his paper, "Relations between Birth-Orders and Birth-Intervals" ("Population Problems", Vol.5, No.1), it must be more acculate to investigate birth-intervals according to birth-orders with couples possessing different numbers of children. Accordingly, by extracting from Birth-power Research Cards, 1,000 cards out of couples with 1-7 children, 750 cards out of couples with 8 children, 465 cards out of couples with 9 children, and 320 cards out of couples with 10 children, respective birth-intervals according to birth-orders were investigated in those couples with different numbers of children.

II

II

First of all, let us see the following Table No.1 to see average birth-intervals (months) according to birth-orders in couples with different numbers of children.

TABLE NO.I. Average Birth-Intervals According to Birth-Orders in Couples with Different Numbers of Children.

	Numbers of Couples	Average Birth-intervals from Marriage to the Birth of First Children	Average Birth-intervals from the Birth of 1st Children to the Birth of 2nd Children	Average Birth-intervals from the Birth of 2nd Children to the Birth of 3rd Children
Couples with 1 child	1,000	30.7(months)	44.9(months)	
" 2 children	"	28.7	37.4	44.8(months)
" 3 "	"	27.0	35.6	36.8
" 4 "	"	23.8	33.3	35.5
" 5 "	"	23.7	32.2	35.0
" 6 "	"	23.0	31.2	31.6
" 7 "	"	22.8	29.7	30.6
" 8 "	750	20.6	28.1	28.7
" 9 "	465	20.3	26.6	28.0
" 10 "	320	21.1		

Average Birth-intervals from the Birth of 3rd Children to the Birth of 4th Children	Average Birth-intervals from the Birth of 4th Children to the Birth of 5th Children
42.6(months)	
37.1	41.3(months)
35.2	36.8
32.7	33.2
32.0	31.2
29.7	29.1
27.6	27.5

Average Birth-intervals from the Birth of 5th Children to the Birth of 6th Children	Average Birth-intervals from the Birth of 6th Children to the Birth of 7th Children
42.8(months)	
35.1	40.6(months)
32.0	33.5
29.5	30.8
28.0	28.2

Average Birth-intervals from the Birth of 7th Children to the Birth of 8th Children	Average Birth-intervals from the Birth of 8th Children to the Birth of 9th Children
38.0(months)	
32.0	37.8(months)
29.3	30.2

Average Birth-intervals from the Birth of 9th Children to the Birth of 10th Children
35.7(months)

Two

Two phenomena must be noticed in this Table.
In the first place, in proportion to the increase
of children, average birth-intervals become long;
and in the second place, in the same birth-order,
average birth-intervals in those couples possessing
many children are short, compared with those with
small numbers of children. More in details about
the first phenomenon. In the couple possessing two
children, the average birth-interval from marriage
to the birth of the first child is 28.7 months,
while the average birth-interval from the birth of
the first child to that of the second child is 44.9
months, there being the difference of 16.2 months
between them. In other words, the average birth-
interval from the birth of the 1st child to the
birth of the 2nd child is about one year and four
months longer than that from marriage to the birth
of the first child.

It is so without exception in couples possess-
ing more than three children. In short, we can say
that as birth increase, the average birth-interval
becomes long. When we calculate average birth-
intervals, taking together couples both prolific and
unprolific, regardless to the numbers of children
we come to the conclusion that the average birth-
interval gradually shortens with prolific couples.
Whereas in regard to couples with different numbers
of children, the conclusion is quite the other way:
as birth increase, the average birth-interval
longthens. This phenomenon is more agreeable with
what we expect. As births increase, the mother
gets order. As the mother gets order, her repro-
ductive power decrease, without taking into consi-
deration the question of the desire for child-birth.
Hence the natural result as shown in the Table No.I.

However, the Table No.I only shows that,
compared with average birth-intervals from marriage
to the birth of the first-children, average birth-
intervals according to birth-orders are longer with
any couples possessing different numbers of children.

It

It is necessary, therefore, to investigate the
differences between average birth-intervals of
respective orders, such as the difference between
the average birth-interval from the birth of the
first child to that of the second child and the
average birth-interval from the birth of the 2nd
child to that of the 3rd child, or the difference
between the average birth-interval from the birth
of the 2nd child to that of the 3rd child and the
average birth-interval from the birth of the 3rd
child to that of the 4th child. The following Table
No.II is the result of the investigation made for
that purpose.

TABLE NO.II. The Rate of Increase between
Average Birth-intervals according
to Birth-Orders in Couples with
Different Numbers of Children. (%)

The rate of increase between average birth-intervals
from marriage to the birth of first children and
average birth-intervals from the birth of 1st children
to that of 2nd children.

The rate of increase of birth-intervals between 2nd
children and 3rd children.

The rate of increase of birth-intervals between 3rd
children and 4th children.

The rate of increase of birth-intervals between 4th
children and 5th children.

The rate of increase of birth-intervals between 5th
children and 6th children.

The rate of increase of birth-intervals between 6th
children and 7th children.

The rate of increase of birth-intervals between 7th
children and 8th children.

The rate of increase of birth-intervals between 8th
children and 9th children.

The rate of increase of birth-intervals between 9th
children and 10th children.

Couples with									
2 children	56.45 %								
3 "	38.42	19.79 %							
4 "	49.53	3.37	15.76 %						
5 "	40.51	6.61	4.51	11.32 %					
6 "	40.00	8.70	0.57	4.55	16.30 %				
7 "	36.84	1.38	3.48	1.53	5.72	15.67 %			
8 "	44.17	3.03	4.58	-2.50	2.56	4.69	13.43 %		
9 "	38.42	2.14	3.48	-2.02	1.37	4.41	3.90	18.13 %	
10 "	26.07	5.27	-1.43	-0.36	1.82	0.71	3.90	3.07	18.21

According to this Table No.II, with any couples possessing different numbers of children, the rate is considerably large with the average birth-interval from the birth of the 1st child to that of the 2nd child, compared with the average birth-interval from marriage to the birth of the first child. In other words, with couples possessing two children, the increase rate is highest, 56.45%. Couples possessing 10 children show the lowest rate of increase, which is, however, still the increase of 26.07%. On the other hand, the rate of increase between average birth-intervals according to birth-orders is markedly small, such as that between average birth-intervals of the 2nd child and the 3rd child, or that between average birth-intervals of the 3rd child and the 4th child. In some cases, the rate of increase shown minus. With couples possessing 9 children, the average birth-interval between the birth of the 4th child and that of the 5th child is, even though a little bit, shorter than the average birth-interval between the birth of the 3rd child and that of the 4th child. Again, with couples possessing 10 children, the average birth-interval between the birth of the 3rd child and that of the 4th child is shorter than the average birth-interval between the birth of the 2nd child and that of the 3rd child, and the average birth-interval between the birth of the 4th child and that of the 5th child is shorter than the average birth-interval between the birth of the 3rd child and that of the 4th child.

Another

Another noteworthy phenomenon is that, in case of couples possessing more than 4 children, the average birth-interval of the youngest child is considerably longer than those of children of higher orders. For example, with couples possessing 4 children, the rate of increase of the average birth-interval between the 2nd child and the 3rd child is only 3.37%, while the rate of increase of the average birth-interval between the 3rd child and the 4th child (the youngest child) is nearly three times as high as 15.76%. This is so without exception in couples possessing more than 4 children.

III .

Let us the second phenomenon, i.e., when average birth-intervals of the same birth-order are compared according to couples whose children are differnet in number, the mere children they possess, the shorter does the average birth-interval become. For instance, see the Table No.I . The average birth-interval from marriage to the birth of the 1st child is 30.7 months with the couple possessing one child, 28.7 months with the couple possessing two children, and 27.0 months with the couple possessing three children, thus the average birth-interval shortening proportionally. With the couple possessing ten children, it is 0.8 month longer than with the couple possessing nine children. This is probably an exceptional discrepancy due to the small number of date.

This is a tendency which is without exception to be found not only with the average birth-interval from marriage to the birth of the 1st child, but also with all average birth-intervals according to birth-orders such as the average birth-interval from the 1st child to the 2nd child or that from the 2nd child to the 3rd child. Therefore, we can say that the average birth-interval of the same birth-order shortens in proportion to the increase of children

the

the average birth-interval longthens, but in the
same order, compared with unprolific couples,
their average birth-interval is always short.
Average birth-intervals of children of the same
order, with a few exceptions are shorten in prolific
couples than in unprolific couples. In so far as
the conception period comes to expire almost at the
same time in any couple, birth-speed naturally in-
creases more in prolific couples than in unprolific
ones. This is what entirely complies with what we
expect. Then the question is how average birth-
intervals of children of the same order shorten in
prolific couples, compared with unprolific ones.
We hace two methods of investigation in this case.
One is to examine the arts of shortening by means
of ever comparing couples with one child with couples
with more than one child, for instance, with what
rate average birth-intervals from marriage to the
birth of first children shorten in couples with one
child compared with those possessing two children,
how it is in couples possessing one child with those
possessing three children, and so on.

The second method is certainly more suitable,
in order to compare rates in average birth-intervals
of children of the same order in respective couples
with different numbers of children. The following
is a table resulted from the second method of inves-
tigation.

TABLE NO.III. The Rate of Shortening of Average
Birth-Intervals of Children of the
Same Order in Respective Couples
with Different Numbers of Child-
ren.(%)

The rate of shortening of the average birth-inter-
val from marriage to birth of the 1st child.

The rate of shortening of the average birth-inter-
val from the birth of the 1st child to that of the
2nd child.

The

- 9 -

The rate of shortening of the average birth-intervals from the birth of the 2nd child to that of the 3rd child.

The rate of shortening of the average birth-interval from the birth of the 3rd child to that of the 4th child.

The rate of shortening of the average birth-interval from the birth of the 4th child to that of the 5th child.

The rate of shortening of the average birth-interval from the birth of the 5th child to that of the 6th child.

The rate of shortening of the average birth-interval from the birth of the 6th child to that of the 7th child.

The rate of shortening of the average birth-interval from the birth of the 8th child to that of the 9th child.

The rate of shortening of the average birth-interval from the birth of the 9th child to that of the 10th child.

Couples with									
2 children	-6.51%								
3 "	-5.92	-1670%							
4 "	-12.22	-481	-1786%						
5 "	-0.32	-646	-343	-1286%					
6 "	-2.95	-330	-141	-512	-1090%				
7 "	-0.87	-311	-971	-710	-978	-1799%			
8 "	-9.65	-481	-316	-214	-678	-883	-749%		
9 "	-1.46	-539	-641	-719	-673	-781	-806	-1579%	
10 "	13.94	-534	-244	-707	-550	-508	-844	-844	-2011%

According

According to this Table No.III, average
birth-intervals of children of the same order
always shorten, with one or two exception, in
proportion as couples increase children. However,
the rate of shortening cannot be said to keep the
constant percentage in proportion to the increase
of children. In other words, its rate of shorten-
ing does not decrease with the straightline tendency.
For instance, the average birth-interval from mar-
riage to the birth of the 1st child shows the
decrease of 6.51% in the couple with two children,
compared with the couple with one child, whereas
the decrease of 5.92% is shown in the couple with
three children, compared with the couple with two
children. However, compared with the couple with
three children, the couple with four children has
a bigger rate of shortening, 12.22%. And comparing
the couple with four children with the couple with
five children, the difference between average birth-
intervals is extrmely small, loss than 1%.
Contrary to this, for one exception, the average
birth-interval of the couple with ten children
shows the increase of 3.94%, compared with the couple
with nine children.

In short, average birth-intervals of children
of the same order shorten proportionately as couples
increase the numbers of their children, but the
shortening does not follow a constant rate. The
same conclusion is attained when average birth-
intervals of children of different orders (e.g.,
average birth-intervals from the birth of the 1st
child to that of the 2nd, from the birth of the 2nd
child to that of the 3rd, etc.) are compared in
couples with different numbers of children.

In this way, the rate of shortening is consi-
derably different in each case, the difference
being between 13.94% and -20.11%. The rate of
shortening of the average birth-interval from
marriage to the birth of the first child is

generally

generally small when couples according to the
numbers of their children are compared with one
another. And in regard to other birth-orders
e.g., the average birth-interval from the birth
of the second child to that of the third, etc.,
the difference of average birth-intervals of
children between couples, the numbers of those
children are smallest, and couples who come next
to them in the numbers of their children, is
considerably big. The difference of average birth-
intervals from the birth of the first child to that
of the second comes to -16.80% between couples with
two children and those with three children, but it
is very small between other couples according to
the numbers of their children. And the difference
of average birth-intervals from the birth of the
second child to that of the third child comes to
-17.86% between couples with three children and
those with four children, but it is likewise very
small between other couples according to the
numbers of their children. Why is it that the
difference of average birth-intervals of children
between couples with the smallest number of child-
ren and those who come next to them is considerably
big? For this question, let us see the next fact.
According to our preceding observation, with the
couple possessing two children, the average birth-
interval from the birth of the first child to that
of the second is long, and with the couple possess-
ing three children, the average birth-interval from
the birth of the second child to that of the third
is long.

IV

We have tried some observations about average
birth-intervals of children with couples according to
the numbers of their children, and further let us have
a look at the distribution children according to birth
intervals with couples possessing different numbers
of children. For instance, the average birth-interval
from marriage to the birth of the first child is 30.7

<u>months</u>

- 12 -

months in the couple with one child, and 2.1
months in the couple with ten children; the average
birth-interval from the birth of the first child to
that of the second child is 44.9 months in the
couple with two children, and 26.6 months in the
couple with ten children. This is, however, all
the average estimation, and those children are not
always born with those average birth-intervals.
Some are born with birth-intervals far shorter
than those average birth-intervals, and others with
birth-intervals far longer than those average birth-
intervals are distributed. Especially the point of
the question is what difference there is between
prolific couples and prolific ones. In our study,
these with one child and those with two children
are considered unprolific couples, while those with
more than seven children prolific ones. And our
study is pointed to the distributions of children
according to birth-intervals in first- and second-
born children.

The following Table No.IV shows the distri-
butions of children according to birth-intervals
of first-born children in unprolific couples and
prolific ones.

TABLE NO.IV. Distributions of Children
According to Birth-Intervals
of First Children in Unprolific
Couples and Prolific Couples.

Couples according to numbers of children.
Birth-interval.
Below 12 months.
13 months - 24 months.
25   - 36
:   :
:   :
Above 169 months.
Total.

Couples with 1 child.		Couples with 2 child-
Actual number	Percent	ren.
:		
:		
:		
246	24.6	According

According to this Table No.IV, in couples both
unprolific and prolific, births of first children are
of the great number from 13 to 24 months after marriage,
the second in number being loss than 12 months after
marriage, the third from 25 to 36 months after marriage;
they become loss as birth-intervals lengthen. Thus the
mode lies from 13 to 24 months after marriage.
The The percentage of distribution is 39.1% in the
couple with one child, and it becomes large as the
couple increases children: those with two children are
of 39.9%, which is a bit increased rate. These with
seven children show 45.9%, these with eight children
47.5%, and more than half of those with nine children
have their first children from 13 to 24 months after
marriage.

In case of unprolific couples, the rate of those
who have their first children more than 36 months
after marriage is extremely small, but it cannot be
denied that some couples have children 10 years (120
months) after marriage. Contrary to this, in case of
prolific couples, there are almost no couples that
have children more than 10 years after marriage.
If the lapse of more than 10 years after marriage
is needed for the birth of first children, it must
certainly be very hard for them to have many a child.

The following Table No.V shows the distributions
of children according to birth-intervals of second-
born children in unprolific couples and prolific
couples.

TABLE NO.V. Distributions of Children According
to Birth-intervals of Second Child-
ren in Unprolific Couples and Pro-
lific Couples.

Couples according to numbers of children.
Birth-intervals.
Below 12 months.
13 months - 24 months.
25 " - 36 "
:   :
:   :
Above 169 months.
Total

Couples with 2 children.		Couples with 7 children.
Actual number	Percentage.	
12	1.2	

This Table No.V shows that the mode of children born lies from 25 to 36 months after the birth of first children in couples both unprolific and prolific. Namely, it moves to 25 - 36 months from 13 - 24 months in case of the birth of first children, thus birth-intervals lengthening. Compared with those first children, the average birth-intervals of second children lengthen. Corresponding to this, the mode moves from 13 - 24 months to 25 - 36 months. However, the mode shows in percentage is only 30.9% in couples with two children, while in prolific couples it is above 38%, amounting to 41.7% in case of couples with eight children. Further, in case of couples with two children, those who have children 13 - 24 months after the birth of their first children show 25.6%, while in case of prolific couples those who have children 13 - 24 months after the birth of first children still show a big percentage. In case of couples with ten children, those who have children 13 - 24 months after the birth of first children are more than those who have children after 25 - 36 months. In case of couples with two children, there continually appear some, even though very few, who have second children 60 months after the birth of first children, but prolific couples very seldom have second children after the birth of first children.

In short, in case of unprolific couples with only two children, the mode of birth lies 25 - 36 months after the birth of first children, its top is below, compared with that of prolific couples, and the distribution of births is considerably bread.

Contrary

Contrary to this, in case of prolific couples,
although the mode of birth, as in case of un-
prolific couples, lies 25 - 36 months after the
birth of first children, its top is not only far
higher, but also the birth-rate in case of shorter
birth-intervals, i.e., 13 - 24 months after the
birth of first children, is remrkably higher, and
the distribution of births is of an extremely
narrow breath.

(- Dr Ayamori Okasaki)