Revue d'Economie et de Statistique Appliquée
Volume 19 number 3, December 2022
ISSN: 1112-234X EISSN: 2600-6642
Pages : 6-19

CALCULATING ALGERIAN FERTILITY RATES USING MICS4 SPSS SYNTAX FILES

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Received: 08/07/2022 **Accepted** 17/10/2022 Published **online:** 24/10/2022

ABSTRACT: Our ten-year experience in teaching demography has revealed to us that students are unfamiliar with the calculation of some demographic indicators using survey data files. This paper attempts precisely to fill this gap, at least concerning the calculation of fertility rates by age group and the total fertility rate. It should be noted that the institutions that have set up the main demographic and health surveys (MICS and DHS series) often add program files written using different software such as SPSS, STATA, and R. These files make it possible to obtain the all the tables contained in the reports of these surveys. The content of this article is none other than the application of this type of program to the MICS survey carried out in Algeria in 2012. Knowing however that this exercise allowed us to detect an error in the script of the indicator calculation program of fertility, which forced us to contact the people concerned to review the program and the published results.

Keywords: Algeria-MICS4; SPSS syntax; age-specific fertility rate; total fertility rate; tfr2.

JEL Classification : J11 J13

1. INTRODUCTION:

Our doctoral students in demography, from several Algerian universities, often complain about the discrepancies observed between the results they produce and those of the official reports of the same surveys they had used. Such a concern caught the attention of the entire doctoral training staff. This contribution attempts to fill these gaps. It is in fact the first draft in this field, which is focused on the calculation of current fertility indicators, more precisely the fertility rates by age group and the total fertility rate. Other contributions to other demographic indicators will follow. Such initiatives will make it possible to strengthen the skills of doctoral students and, in turn, better promote surveys that have cost the state enormously. By using the syntax files, written by experts from UNICEF and other institutions in charge of demographic and health surveys, doctoral students will benefit twice. In addition to mastering the methodologies followed for the calculation of the various indicators, they will have the opportunity to better master the various data processing software, which will enable them to carry out more research work in a fairly short time, which can guarantee them recognition in national and international scientific forums. The documentation associated with the surveys is very important for the continuous training of users of this type of data

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source. It strengthens their skills and prevents them from possible calculation errors due to incorrect manipulation of data such as incorrect selection of eligible people for the calculation of a given indicator.

The application of syntax files by several stakeholders can reveal possible errors or possible shortcuts that can be integrated by programmers to ensure continuous improvement of their work. With this in mind, this paper has highlighted an error detected through the syntax file relating to the calculations of the current fertility indicators of the MICS4 in order to then propose the appropriate corrections.

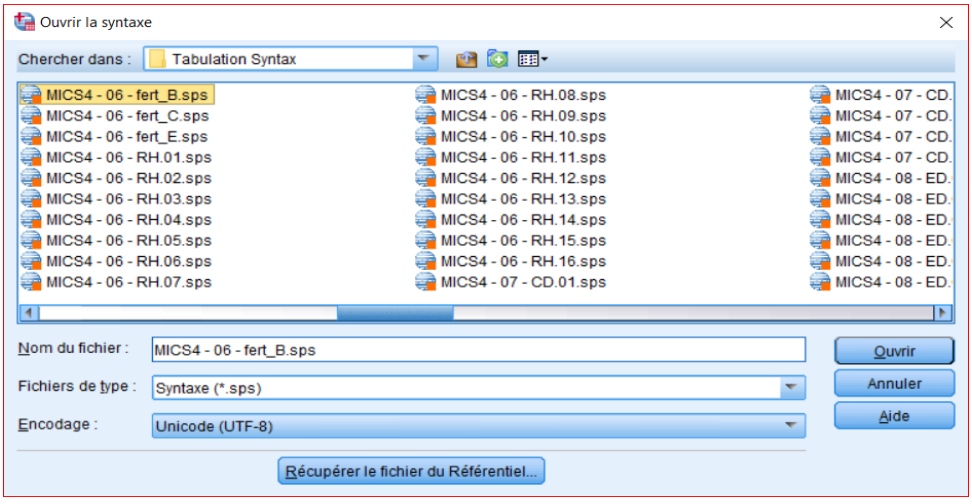
2. METHODS AND MATERIALS:

The data used in this exercise are those of the MICS4 survey, carried out in 2012-2013 by the Algerian MSPRH. Two files concern us more particularly: the birth file (br.sav) and the women's file (wm.sav).

The syntax tabulation pack (a folder containing all the SPSS syntax files for constructing the tables of the results report), downloadable from the survey website: https://mics.unicef.org/tools?round=mics4 #data-processing, includes, among other things, three interdependent files allowing the calculation of the TFR:

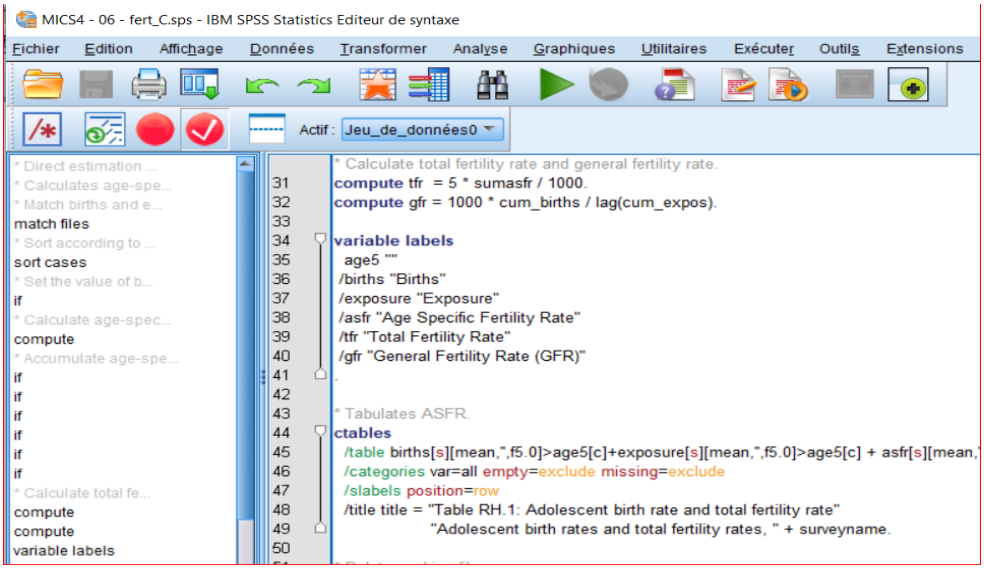
a. MICS4 - 06 - fert_B.sps (calculation of births: file births. sav);
b. MICS4 - 06 - fert_C.sps (calculation of age-specific fertility rates);
c. MICS4 - 06 - fert_E.sps (calculation of female exposure: exposure.sav).

Figure N° 1. The 'Tabulation syntax' pack and the files necessary for the calculation of fertility rates



Commands in SPSS syntax files are numbered sequentially (see Figure 2). To make the necessary corrections, reference will be made to this line number to indicate the location of the commands to be added.

Figure N°2. Overview of the MICS4 – 06 – fert_C.sps file



It will be useful to use an external means to perform the same calculations, and to verify the validity of the published results. To do this, we can use the package called 'tfr2' (a STATA extension developed by Bruno Schoumaker). We will then consult the report of the results of the MICS4-2012 survey, the coordinates of which appear in the bibliographical list, to make comparisons between our figures and those recorded in the tables of the survey report.

3. RESULTS:

To use the SPSS syntax files, you must first create a working folder to store the files needed for calculating fertility rates:

- the ‘br.sav’ and ‘wm.sav’ data files
- the three syntax files (MICS4 - 06 - fert_B.sps, fert_C.sps and fert_E.sps).

3.1. Corrections to be made to the MICS4 - 06 - fert_B.sps file:

To run the 'B' file (do this first) you must first designate the working folder by adding the line that appears below (line 6):

```
6  cd 'C:\Users\Slash\Desktop\Personnes_Periodes_Fertility\Algeria_MICS4_Datasets'.
7  get file='bh.sav'.
```

(The learner is free to decide on the location of the folder).

It is advisable to convert the 'subgroup' macro to a comment to avoid receiving an error message.

It is also possible to develop the macro beforehand (before calling it by its name). To be able to perform calculations on subgroups, this command should first be corrected as follows (example):

```
22  * Region 1.
23
24  define subgroupname ()
25  '(Region 1)'
26  !enddefine.
27  define subgroup ()
28  select if (HH7 = 1).
29  !enddefine.
30
31  subgroup
```

The first block shows how to create a macro called 'subgroup', which selects the observations satisfying the condition HH7 = 1, i.e., the observations belonging to the 1st region: 'Territorial Programming Area North center'. The last line runs the macro.

It is also necessary to change the variable name 'ccdob' (this name does not exist in the 'br.sav' file) to 'BH4C' (date of birth of the child in CMC) throughout the file.

```
27  * The two in the following equation creates age groups 1-7 instead of 3-9.
28  compute age5 = trunc(agembm/60) - 2.
29  formats age5 (f1.0).
30  variable labels age5 "Mother's age at time of the birth".
31  value labels age5
32          1 '15-19'
33          2 '20-24'
34          3 '25-29'
35          4 '30-34'
36          5 '35-39'
37          6 '40-44'
38          7 '45-49'
39  .
40
41  * Determine period of birth.
42  compute colper = trunc((upplim - ccdob)/period).
43  format colper (f1.0).
44  variable label colper "Number of years preceding the survey".
```

The next step is to modify the 'aggregate' command, which creates a 'births.sav' file containing the distribution of births in the three years preceding the survey according to the age of the mother (five-year groups).

```
60  aggregate
61    /outfile = 'births.sav'
62    /break = colper age5
63    /births = n(age5).
```

3.2. Corrections to be made to the MICS4 - 06 - fert_E.sps file

To run the 'E' file, you must first designate the working folder with the command:

```
14  cd 'C:\Users\Slash\Desktop\Personnes_Periodes_Fertility\Algeria_MICS4_Datasets'.
15  get file='wm.sav'.
```

It is advisable to convert the 'subgroup' macro to comment so as not to receive an error message.

```
20  * following line is a macro defining the subgroup to use -- see fert.sps.
21  * subgroup.
```

Secondly, we must modify the ‘aggregate’ command. The latter makes it possible to calculate the number of women-years of exposure in the age group of arrival during the three years preceding the survey.

```
91  * Output high end exposure to aggregate file.
92  aggregate
93    /outfile = !1
94    /break = colper age5
95    /exposure = n(higexp).
```

The next step is also to modify the ‘aggregate’ command a second time to be able to calculate the number of female-years of exposure in the starting age group during the three years preceding the survey.

```
115  * Output low end exposure to aggregate file.
116  aggregate
117    /outfile = !2
118    /break = colper age5
119    /exposure = n(lowexp).
```

Another move is also necessary. It is necessary to proceed from first on board to the correction of the command 'add files' by removing the point in the first line of the command. This combines the files of women-years of exposure for the five periods (of three years) preceding the survey.

```
136  add files
137    /file = "higexp1.sav"
138    /file = "lowexp1.sav"
139    /file = "higexp2.sav"
140    /file = "lowexp2.sav"
141    /file = "higexp3.sav"
142    /file = "lowexp3.sav"
143    /file = "higexp4.sav"
144    /file = "lowexp4.sav"
145    /file = "higexp5.sav"
146    /file = "lowexp5.sav".
```

The following move consists in modifying the 'aggregate' command, which makes it possible to create an 'exposure.sav' file comprising the distribution of women-years of exposure according to the age of the mothers (of the five-year groups) and the five periods preceding the 'investigation.

```
151  aggregate
152    /outfile = 'exposure.sav'
153    /break = colper age5
154    /exposure = sum(exposure).
```

3.3. Corrections to be made to the MICS4 - 06 - fert_C.sps file

For the execution of the file 'C', it is advisable first of all to add three lines indicating the working folder and calling upon the two syntax files 'B' and 'E' (line 7 of the program) and that in using the 'include' command:

```
7   cd 'C:\Users\Slash\Desktop\Personnes_Periodes_Fertility\Algeria_MICS4_Datasets'.
8
9   include 'MICS4 - 06 - fert_B.sps'.
10  include 'MICS4 - 06 - fert_E.sps'.
```

This means that once the corrections -which are necessary- are carried out on the first two files: 'B' and 'E', the compilation of the file 'E' is enough to obtain the expected results (i.e. fertility rates and TFR).

The last work that remains to be done is to fix the 'ctables' command, which generates the table of results. In this one, there are quotation marks that are missing and which must surround the name of the survey 'surveyname' which has been replaced by 'Algeria MICS4-2012'.

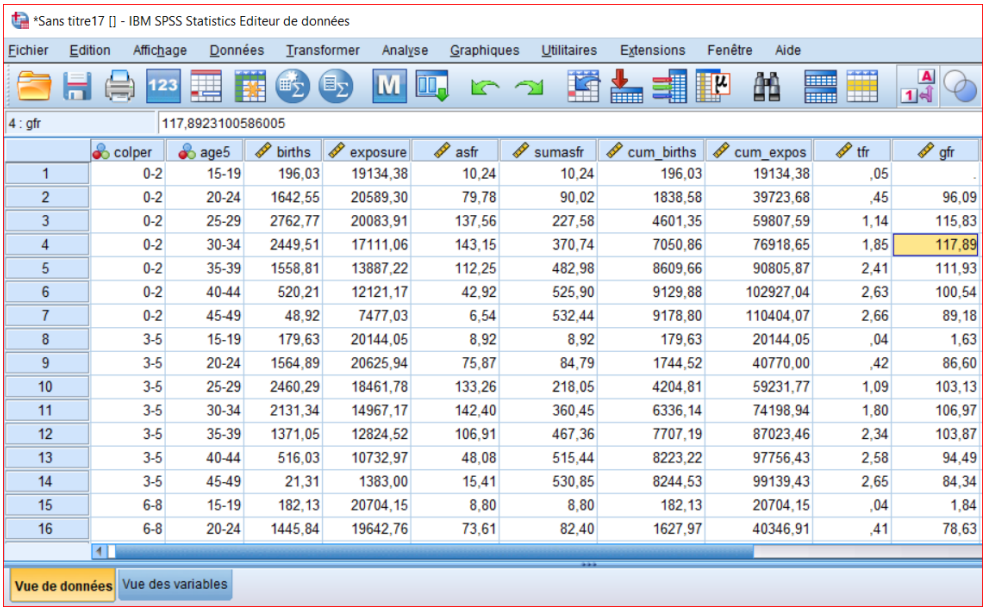
```
51  ctables
52    /table births[s][mean,",f5.0]>age5[c]+exposure[s][mean,",f5.0]>age5[c] + asfr[s][mean,",f5.0]>age5[c]+tfr[s][maximum,",f5.1]+gfr[s][maximum,",f5.1] by colper[c]
53    /categories var=all empty=exclude missing=exclude
54    /slabels position=row
55    /title title = "Table RH.1: Adolescent birth rate and total fertility rate"
56              "Adolescent birth rates and total fertility rates, " + "Algeria MICS4-2012".
```

3.4. Application and proposed corrections

The selection of all the lines of the file 'C' and its execution make it possible to compile the three files 'B' then 'E' and finally 'C', and produce the following results:

A. A data file comprising 10 variables (an extract of which is represented by figure n° 3):

Figure N° 3. Overview of the data file generated by running the MICS4 – 06 – fert_C.sps syntax file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4 : gfr 117,8923100586005

	colper	age5	births	exposure	asfr	sumasfr	cum_births	cum_expos	tfr	gfr
1	0-2	15-19	196,03	19134,38	10,24	10,24	196,03	19134,38	,05	.
2	0-2	20-24	1642,55	20589,30	79,78	90,02	1838,58	39723,68	,45	96,09
3	0-2	25-29	2762,77	20083,91	137,56	227,58	4601,35	59807,59	1,14	115,83
4	0-2	30-34	2449,51	17111,06	143,15	370,74	7050,86	76918,65	1,85	117,89
5	0-2	35-39	1558,81	13887,22	112,25	482,98	8609,66	90805,87	2,41	111,93
6	0-2	40-44	520,21	12121,17	42,92	525,90	9129,88	102927,04	2,63	100,54
7	0-2	45-49	48,92	7477,03	6,54	532,44	9178,80	110404,07	2,66	89,18
8	3-5	15-19	179,63	20144,05	8,92	8,92	179,63	20144,05	,04	1,63
9	3-5	20-24	1564,89	20625,94	75,87	84,79	1744,52	40770,00	,42	86,60
10	3-5	25-29	2460,29	18461,78	133,26	218,05	4204,81	59231,77	1,09	103,13
11	3-5	30-34	2131,34	14967,17	142,40	360,45	6336,14	74198,94	1,80	106,97
12	3-5	35-39	1371,05	12824,52	106,91	467,36	7707,19	87023,46	2,34	103,87
13	3-5	40-44	516,03	10732,97	48,08	515,44	8223,22	97756,43	2,58	94,49
14	3-5	45-49	21,31	1383,00	15,41	530,85	8244,53	99139,43	2,65	84,34
15	6-8	15-19	182,13	20704,15	8,80	8,80	182,13	20704,15	,04	1,84
16	6-8	20-24	1445,84	19642,76	73,61	82,40	1627,97	40346,91	,41	78,63

Vue de données Vue des variables

Presentation of the variables contained in the previous figure in addition to how they were calculated is set out below.

colper: Represents the 5 periods of the three years preceding the survey: 2010-2012; 2007-2009; 2004-2006; 2001-2003; 1998-200 (see MICS4 report, p 126);

age5: The age groups of the mothers (15-19; 20-24; …. 45-49);

births: Births by age group for the different periods preceding the survey;

exposure: women-years of exposure by age group;

asfr: Age-specific fertility rates per thousand, which correspond to the result of dividing births by women-years of exposure;

sumasfr: The cumulative 'asfr';

cum_births: Cumulative births, variable entering into the calculation of the general fertility rate 'the numerator';

cum_exposure: The cumulative woman-years of exposure, variable to use to calculate the general fertility rate (the denominator);

tfr: Five times 'sumasfr' divided by a thousand to get the ISF;

gfr: The division of cumulative births by the previous value of cumulative women-years of birth to arrive at the general fertility rate (the last line associated with the age group (45-49 years).

B. A second result translated by the following table is extracted from the SPSS output window:

Figure N° 4. Table produced by running the MICS4 – 06 – fert_C.sps syntax file

Table RH.1: Adolescent birth rate and total fertility rate
Adolescent birth rates and total fertility rates, Algeria MICS4-2012

			colper Number of years preceding the survey				
			0 0-2	1 3-5	2 6-8	3 9-11	4 12-14
births Births	age5	1 15-19	196	180	182	177	207
		2 20-24	1643	1565	1446	1269	1308
		3 25-29	2763	2460	2151	1930	1799
		4 30-34	2450	2131	1909	1861	1658
		5 35-39	1559	1371	1339	1108	405
		6 40-44	520	516	351	14	.
		7 45-49	49	21	.	.	.
exposure Exposure	age5	1 15-19	19134	20144	20704	20425	19084
		2 20-24	20589	20626	19643	17801	15615
		3 25-29	20084	18462	16363	14363	13197
		4 30-34	17111	14967	13479	12501	11391
		5 35-39	13887	12825	11818	9389	3123
		6 40-44	12121	10733	5235	364	.
		7 45-49	7477	1383	.	.	.
asfr Age Specific Fertility Rate	age5	1 15-19	10	9	9	9	11
		2 20-24	80	76	74	71	84
		3 25-29	138	133	131	134	136
		4 30-34	143	142	142	149	146
		5 35-39	112	107	113	118	130
		6 40-44	43	48	67	39	.
		7 45-49	7	15	.	.	.
tfr Total Fertility Rate			2,7	2,7	2,7	2,6	2,5
gfr General Fertility Rate (GFR)			117,9	107,0	100,3	99,6	103,8

While the 'tfr' matches those of the table published by the Ministry of Health (Table R.H.1, p 126) for the 5 periods, the age-specific fertility rates in the report (MSPRH, MICS4, p 127) slightly deviate from those provided following the execution of the SPSS syntax file (UNICEF-MICS). These are the age ranges 30-34; 35-39 and 40-44, as well as the general fertility rate (see table below): 118.5‰ against 117.9‰.

Figure N° 5. Table of fertility rates in MICS4 results report

Tableau RH.1A: Taux de fécondité par âge

Taux de fécondité des adolescentes, Taux de fécondité total et par âge spécifique et taux de fécondité général durant les trois dernières années précédant l'enquête, par milieu de résidence, Algérie, 2012 - 2013

Age	Urbain	Rural	Total
15-19[1]	9	13	10
20-24	74	89	80
25-29	132	148	138
30-34	143	146	144
35-39	109	123	114
40-44	40	53	44
45-49	6	8	7
Indice Conjoncturel de Fécondité (ICF)	2,6	2,9	2,7
Taux global de fécondité général (TFG)	112,8	133,3	118,5
[1] Indicateur MICS 5.1; Indicateur OMD 5.4			

Source: RADP, MSPRH, Monitoring the situation of children and women, Multiple Indicator Cluster Surveys (MICS) 2012-2013, Algeria, 2015, p 127.

To be fixed, we calculated these same rates, as well as the TFR for the period of three years preceding the survey using a STATA package known as 'tfr2', and the results obtained agreed more with those produced following when running the syntax files rather than with the table published in the report (see 6th column in the figure below). By way of illustration, the value of the 'tfr' in 2019 was around 87.5‰ (MSPRH, MICS6-22019, p 125), so the value of 83.14‰ is more plausible, given that the level of the fertility did not experience a big change.

Figure N° 6. Table of fertility rates produced by application of tfr2

	agegroup	n_birth	exposure	ASFR	TFR
	15-19	196.0299	19134.38	10.2449	.0512245
	20-24	1642.55	20589.3	79.77688	.3988844
	25-29	2762.769	20083.91	137.5613	.6878064
	30-34	2449.507	17111.06	143.1534	.7157672
	35-39	1558.807	13887.22	112.2476	.5612381
	40-44	520.2144	12121.17	42.91784	.2145892
	45-49	48.9192	7477.03	6.542598	.032713
Sum		9178.796	110404.1		2.662223

But this time, it is the general fertility rate provided by the 'tfr2' package which differs from that obtained by the SPSS syntax files: 83.14‰ against 117.5‰.

Figure N° 7. GFR obtained by using the STATA results

	(count) n_birth	exposure	TFR	gfr	cbr
agegroup					
15-19	196.03	19,134.4	.0512245	0	.455535
20-24	1,642.55	20,589.3	.398884	0	3.92144
25-29	2,762.77	20,083.9	.687806	0	6.86961
30-34	2,449.51	17,111.1	.715767	0	6.27345
35-39	1,558.81	13,887.2	.561238	0	3.95426
40-44	520.214	12,121.2	.214589	0	1.31418
45-49	48.9192	7,477.03	.032713	83.1382	.170275
Total	9,178.8	110,404	2.66222	83.1382	22.9587

At this stage, we are sure that the fertility rates by age provided by the execution of the SPSS syntax files are more accurate, while the general fertility rate poses a problem.

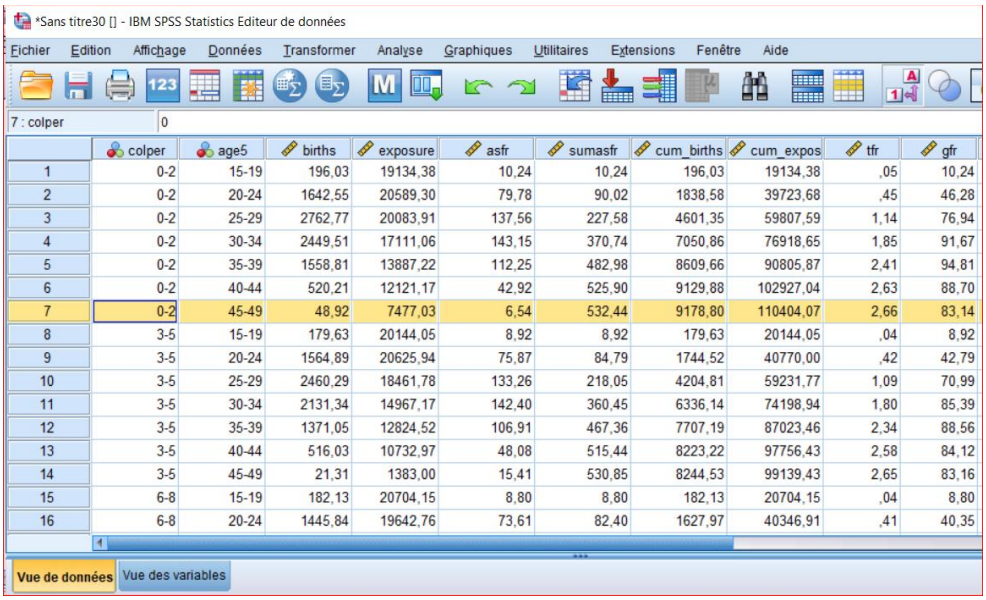
To remedy this problem, it was deemed useful to re-examine the syntax of the 'C' file, which contains the formulas for calculating the elements of the 'gfr'.

In line 38 of file 'C', the command 'compute' generates a variable 'gfr' which is supposed to give the value of the general fertility rate in the line corresponding to the age group 45-49. To do this we had to divide the variable 'cum_births' (cumulative births) by the variable 'cum_expos' (cumulative women-years of exposure), but here we find the function 'lag ()', which means that the division was performed on the previous value of the 'cum_expos' variable.

```
31  if (age5 = 1) cum_births  = births.
32  if (age5 = 1) cum_expos  = exposure.
33  if (age5 > 1) cum_births  = births + lag(cum_births).
34  if (age5 > 1) cum_expos  = exposure + lag(cum_expos).
```

This move caused the value of the ‘gfr’ to be wrong. By removing the 'lag' function, the division gives a 'gfr' of 83.14‰, and everything is back to normal.

Figure N° 8. The wrong initial value of GFR



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7 : colper | 0

	colper	age5	births	exposure	asfr	sumasfr	cum_births	cum_expos	tfr	gfr
1	0-2	15-19	196,03	19134,38	10,24	10,24	196,03	19134,38	,05	10,24
2	0-2	20-24	1642,55	20589,30	79,78	90,02	1838,58	39723,68	,45	46,28
3	0-2	25-29	2762,77	20083,91	137,56	227,58	4601,35	59807,59	1,14	76,94
4	0-2	30-34	2449,51	17111,06	143,15	370,74	7050,86	76918,65	1,85	91,67
5	0-2	35-39	1558,81	13887,22	112,25	482,98	8609,66	90805,87	2,41	94,81
6	0-2	40-44	520,21	12121,17	42,92	525,90	9129,88	102927,04	2,63	88,70
7	0-2	45-49	48,92	7477,03	6,54	532,44	9178,80	110404,07	2,66	83,14
8	3-5	15-19	179,63	20144,05	8,92	8,92	179,63	20144,05	,04	8,92
9	3-5	20-24	1564,89	20625,94	75,87	84,79	1744,52	40770,00	,42	42,79
10	3-5	25-29	2460,29	18461,78	133,26	218,05	4204,81	59231,77	1,09	70,99
11	3-5	30-34	2131,34	14967,17	142,40	360,45	6336,14	74198,94	1,80	85,39
12	3-5	35-39	1371,05	12824,52	106,91	467,36	7707,19	87023,46	2,34	88,56
13	3-5	40-44	516,03	10732,97	48,08	515,44	8223,22	97756,43	2,58	84,12
14	3-5	45-49	21,31	1383,00	15,41	530,85	8244,53	99139,43	2,65	83,16
15	6-8	15-19	182,13	20704,15	8,80	8,80	182,13	20704,15	,04	8,80
16	6-8	20-24	1445,84	19642,76	73,61	82,40	1627,97	40346,91	,41	40,35

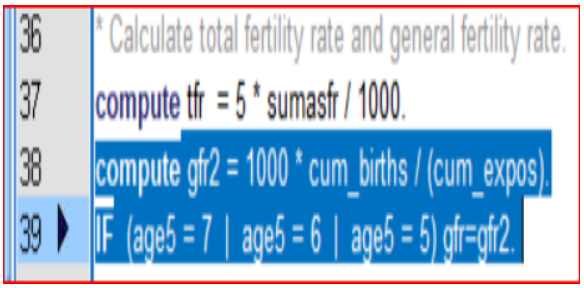
Vue de données | Vue des variables

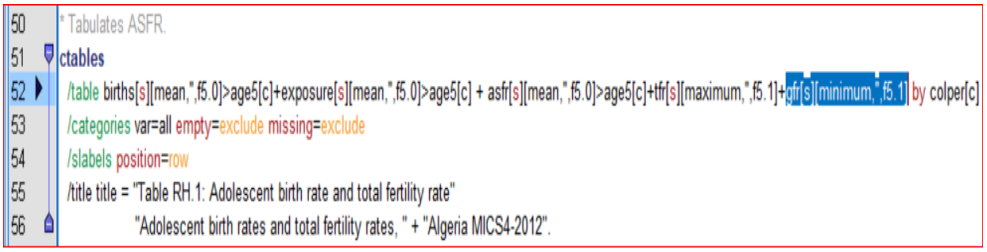
Another error in the 'ctables' command causes the value of 'gfr' to be wrong in the generated table. The integration of the 'maximum' function with 'gfr' makes the program take the maximum value of the variable in question for each period, which is 94.21‰ (for the 1st period) as it took before the correction of the calculation of 'gfr' the value 117.9‰.

```
* Tabulates ASFR.
ctables
/table births[s][mean,",f5.0]>age5[c]+exposure[s][mean,",f5.0]>age5[c] + asfr[s][mean,",f5.0]>age5[c]+tfr[s][maximum,",f5.1]+gfr[s][maximum,",f5.1] by colper[c]
/categories var=all empty=exclude missing=exclude
/slabels position=row
/title title = "Table RH.1: Adolescent birth rate and total fertility rate"
        "Adolescent birth rates and total fertility rates, " + "Algeria MICS4-2012".
```

To correct the detected mistake, it is possible to create a new variable called 'gfr' after renaming the first 'gfr2'. This new variable takes the values of ‘gfr2’ for the age groups: 35-

39; 40-44 and 45-49. Now, using the 'minimum' function we can have the correct value of the 'gfr' in the table.





The final table looks like this:

Figure N° 9. The final corrected results (GFR)

Table RH.1: Adolescent birth rate and total fertility rate
Adolescent birth rates and total fertility rates, Algeria MICS4-2012

			colper Number of years preceding the survey				
			0 0-2	1 3-5	2 6-8	3 9-11	4 12-14
births Births	age5	1 15-19	196	180	182	177	207
		2 20-24	1643	1565	1446	1269	1308
		3 25-29	2763	2460	2151	1930	1799
		4 30-34	2450	2131	1909	1861	1658
		5 35-39	1559	1371	1339	1108	405
		6 40-44	520	516	351	14	.
		7 45-49	49	21	.	.	.
exposure Exposure	age5	1 15-19	19134	20144	20704	20425	19084
		2 20-24	20589	20626	19643	17801	15615
		3 25-29	20084	18462	16363	14363	13197
		4 30-34	17111	14967	13479	12501	11391
		5 35-39	13887	12825	11818	9389	3123
		6 40-44	12121	10733	5235	364	.
		7 45-49	7477	1383	.	.	.
asfr Age Specific Fertility Rate	age5	1 15-19	10	9	9	9	11
		2 20-24	80	76	74	71	84
		3 25-29	138	133	131	134	136
		4 30-34	143	142	142	149	146
		5 35-39	112	107	113	118	130
		6 40-44	43	48	67	39	.
		7 45-49	7	15	.	.	.
tfr Total Fertility Rate			2,7	2,7	2,7	2,6	2,5
gfr General Fertility Rate (GFR)			83,1	83,2	84,6	85,0	86,1

4. DISCUSSION

The table in the MICS4 results report for fertility rates does not match the one obtained by running the SPSS syntax files, 'fert-C'; 'fert-E' and 'fert-B', the only files in the 'tabulation syntax' pack that can generate the indices in question. The maker of the table had to do some manipulations to get it out in the form it appears in the report, and that's where the error crept in.

The SPSS syntax files supplied with the survey tools contain errors, minimal though they may be, but with serious consequences, to the point of having a general fertility rate deviating by about 35 points from the real value.

5. CONCLUSION:

The SPSS syntax files provided by the survey are not 100% secure, so we have to review them carefully before using them.

It is always useful to try to calculate the different demographic indicators using the packages (macros and extensions) produced by different software and which are increasingly available to support the results of the different analyses.

The forums devoted to DHS and MICS surveys offer programs and macros written in SPSS, SAS, STATA, and even R syntax. They allow the resolution of many problems in the calculation of the various demographic indicators.

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