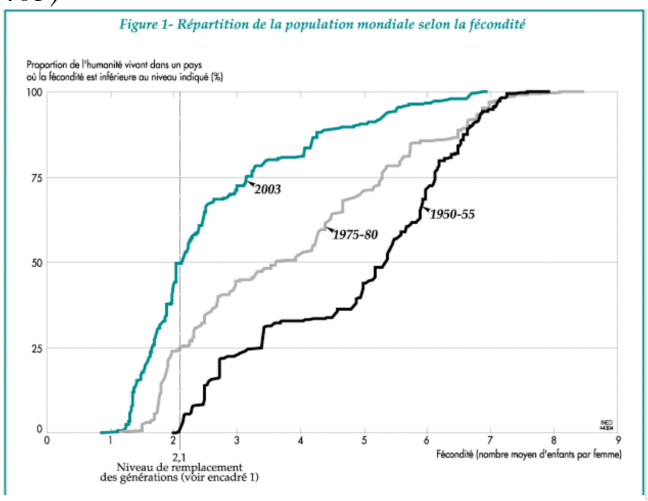
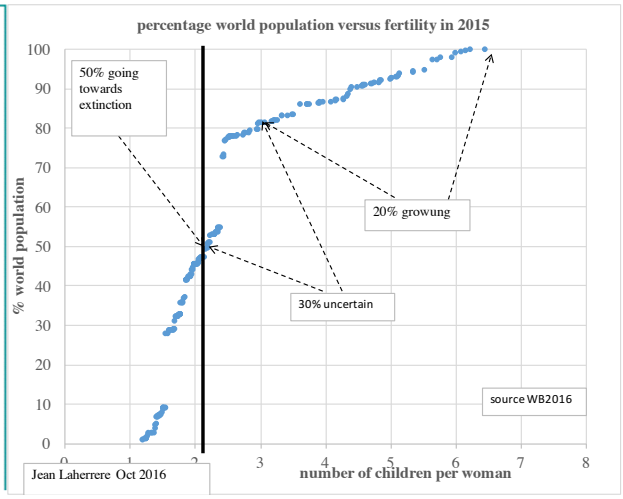
Jean Laherrère 27 July 2019

UN 2019 world population forecasts

In my last papers on population I was worry about half of the world heading towards extinction because a fertility rate below the rate of replacement being 2.1 child per woman.:
"UN 2017: fertility, population and oil & gas production per capita"
https://aspofrance.files.wordpress.com/2017/07/un2017pop-fert-og.pdf
-Club de Nice 2016 "Croissance ou pas croissance selon les données : PIB, population, énergie »
https://aspofrance.files.wordpress.com/2016/11/jl_nice2016longfr.pdf

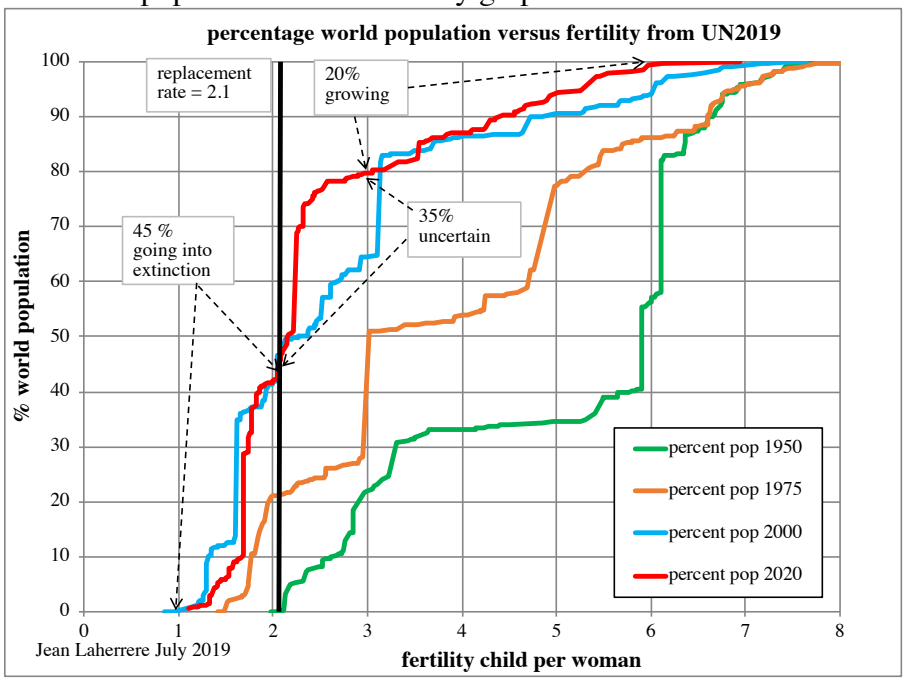
Figure 50: Evolution of fertility rate as a percentage of total population from INED 2004 (P&S 405)





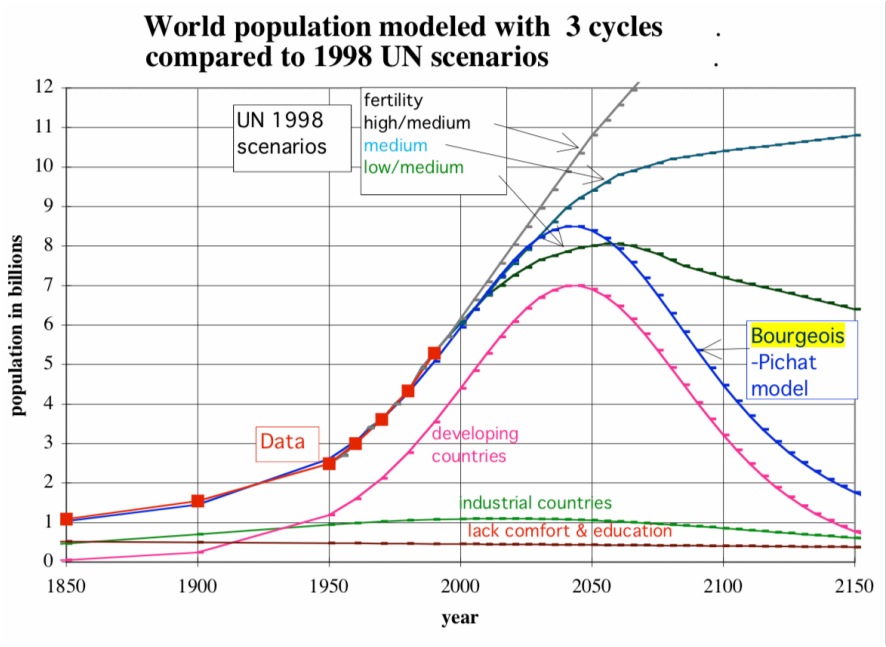
In 1950 no country was below the replacement rate (2.1 child per woman), in 1975 a quarter of the world was below and in 2000 one half of the world was heading towards extinction!

I have updated the world population versus fertility graph with the data from UN 2019



Today 45% of the world population has a fertility below 2.1 child per woman, meaning that they trend towards extinction, 20% is growing and 35% is uncertain.
Extinction comes more from lack of birth than from high death.

In 1999 I forecasted world population using three Hubbert curves, as Bourgeois-Pichat used two.
Laherrère J.H. 2004 «Present & future energy problems» HEC (Hautes Etudes Commerciales) MBA, Sustainable Development Seminar, Jouy- en-Josas France, September 8-9
http://www.hubbertpeak.com/laherrere/HEC-long.pdf
Bourgeois-Pichat head of the INED (Institut National d'Etudes Demographiques) in 1988 modeled the world population with two symmetrical curves, one for the industrial countries and one for the developing countries. In 1999, I used 3 cycles adding a lack of education and no comfort countries in order not to go to complete extinction
Figure 50: World population forecast in 1999 Figure 52: Fertility rate forecasts by USBC (Census Bureau)



From UN2019, the 30 lowest fertility rates for the period 2015-2020 are first South Korea with 1.1, second Taiwan with 1.2 child per woman.
The 30 highest fertility rates for the period 2015-2020 are first Niger with 7, second Somalia with 6.1 child per woman.

rank	country	fertility 2015-2020
1	Republic of Korea	1,1
2	China, Taiwan Province	1,2
3	China, Macao SAR	1,2
4	Singapore	1,2
5	Puerto Rico	1,2
6	Republic of Moldova	1,3
7	Bosnia and Herzegovina	1,3
8	Portugal	1,3
9	Greece	1,3
10	China, Hong Kong SAR	1,3
11	Italy	1,3
12	Spain	1,3
13	Cyprus	1,3
14	Japan	1,4
15	Mauritius	1,4
16	United Arab Emirates	1,4
17	Poland	1,4
18	Ukraine	1,4
19	Saint Lucia	1,4
20	Croatia	1,4
21	Malta	1,5
22	Luxembourg	1,5
23	Serbia	1,5
24	Hungary	1,5
25	North Macedonia	1,5
26	Slovakia	1,5
27	Channel Islands	1,5
28	Canada	1,5
29	Austria	1,5
30	Finland	1,5

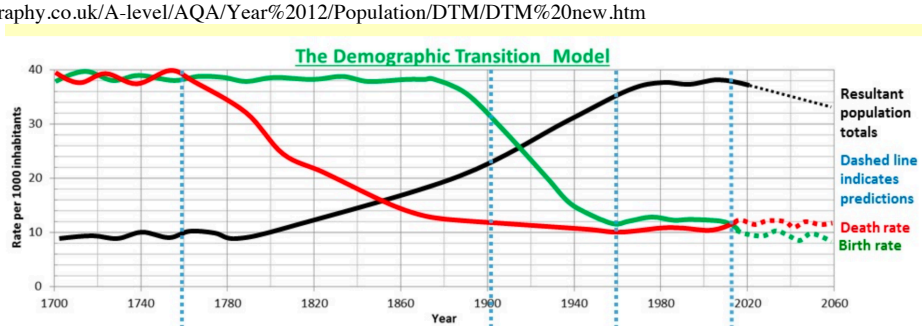
rank	country	fertility 2015-202
1	Niger	7,0
2	Somalia	6,1
3	Democratic Republic of the Congo	6,0
4	Mali	5,9
5	Chad	5,8
6	Angola	5,6
7	Burundi	5,5
8	Nigeria	5,4
9	Gambia	5,3
10	Burkina Faso	5,2
11	Uganda	5,0
12	United Republic of Tanzania	4,9
13	Mozambique	4,9
14	Benin	4,9
15	Central African Republic	4,8
16	Guinea	4,7
17	South Sudan	4,7
18	Côte d'Ivoire	4,7
19	Zambia	4,7
20	Senegal	4,7
21	Cameroon	4,6
22	Mauritania	4,6
23	Afghanistan	4,6
24	Equatorial Guinea	4,6
25	Guinea-Bissau	4,5
26	Congo	4,5
27	Solomon Islands	4,4
28	Sudan	4,4
29	Togo	4,4
30	Sao Tome and Principe	4,4

Fertility depends primarily from the education of girls and as long as Boko Haram and Taliban attack and kill girls because going to school, the fecundity of those countries will not diminish. Because the insecurity in Africa and the lack of census, past fertility data are unreliable. Furthermore, UN forecasts are based on utopic future fertility rate where every country will go towards the replacement rate of 2.1 child per woman. It is dreaming, not forecasting!

-demographic transition

The demographic transition model in developed countries was based on natality and mortality rate starting together around 40 and declining first on death then on birth to get both around 10 on the model of UK

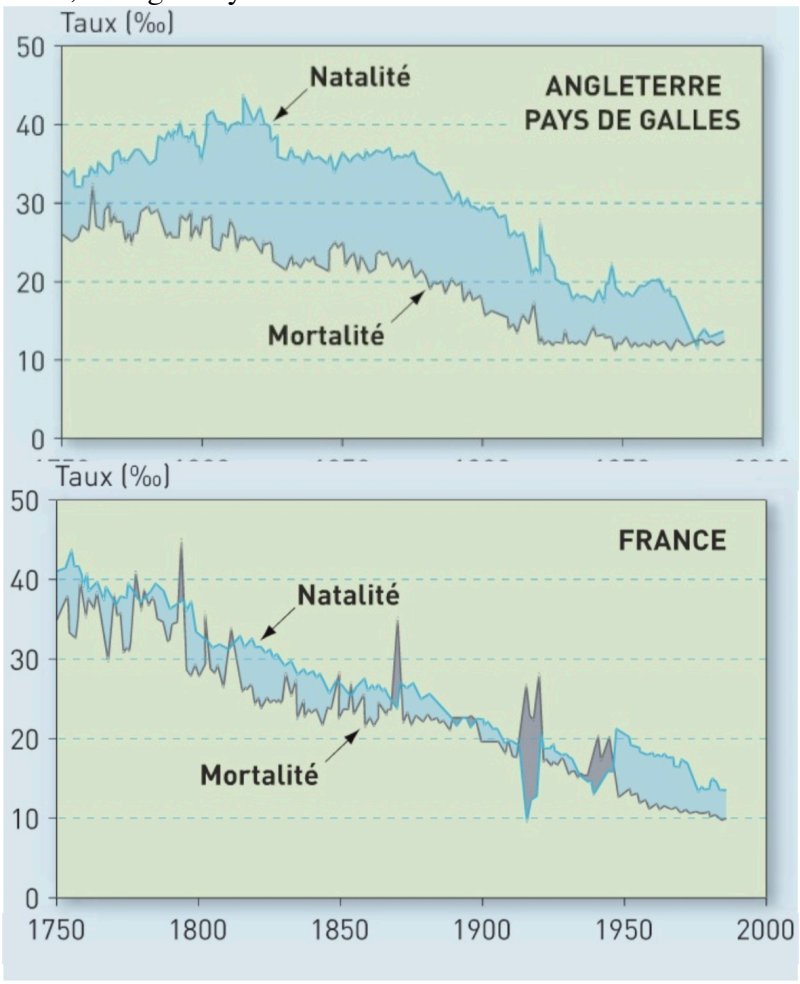
http://www.coolgeography.co.uk/A-level/AQA/Year%2012/Population/DTM/DTM%20new.htm



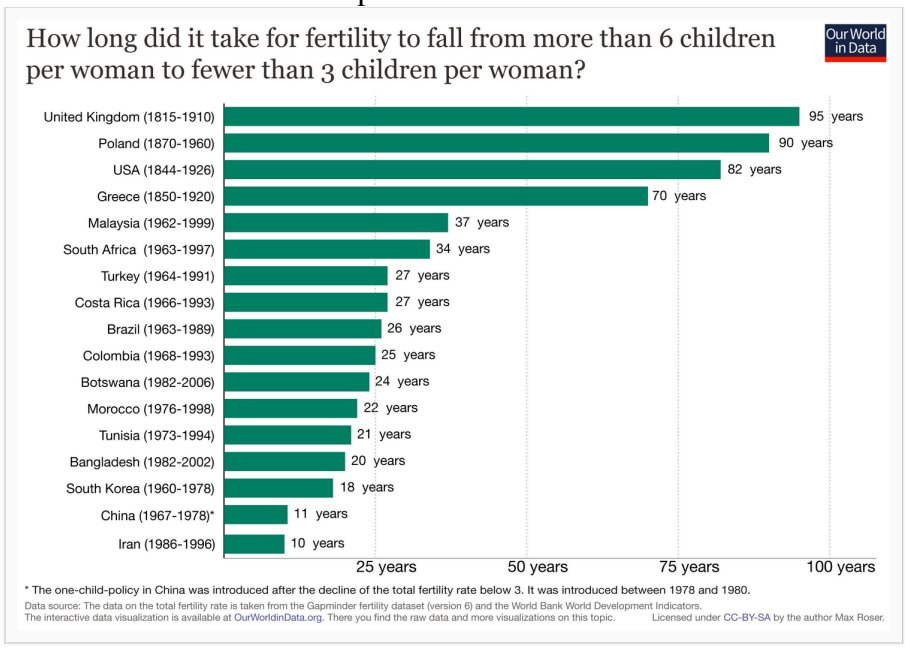
But in fact, this theoretical model occurs rarely in reality as above, most of countries have different behaviors.

JM Decroly homepages.ulb.ac.be/~jmdecrol/Upload_enseignement/SOCAD551_ChIIPP.pdf reports historical birth and death displaying demographic transition

For the period 1750-2000, birth and death rate (per 1000) for England +Wales and for France went from 40 down to 10, taking 250 years.



Max Roser in his 2017 Fertility rate https://ourworldindata.org/fertility-rate reports the number of years for the fertility to fall from 6 to 3 children per woman



It is obvious that countries behave differently.

Willing to find global rules in the world behavior means that human beings have all the same belief, religion, policy: they have not, as the world is made of differences.

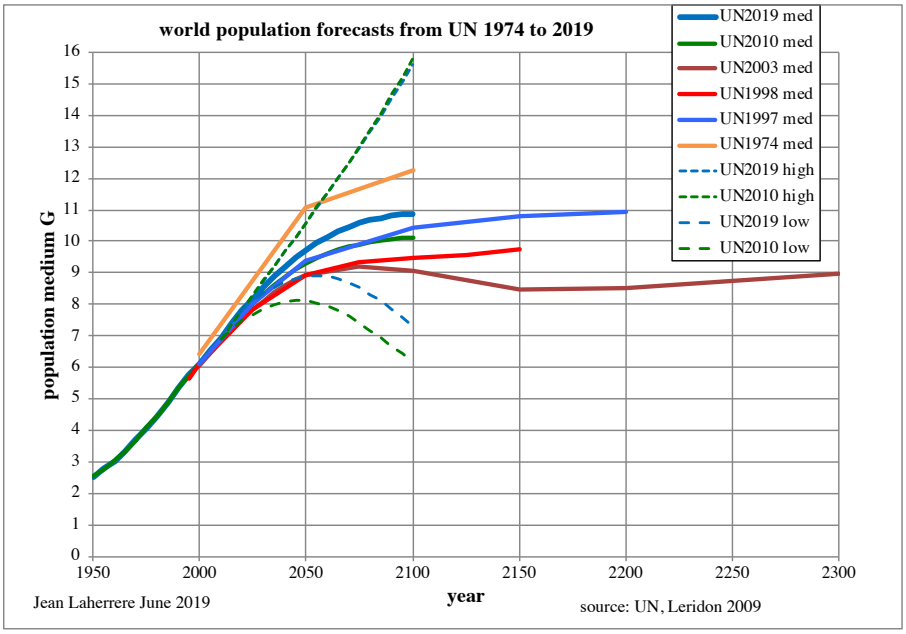
We will see further the birth & death evolution by country and the result for the number of years of the fertility to fall from 6 to 3 children per woman is

fertility year	6 child/w	3 child/w	year
Portugal	before 1800	1970	>170
France	before 1740	1894	>154
Spain	before 1800	1945	>145
Germany	before 1800	1916	>116
Canada	1860	1966	106
UK	1815	1910	95
US	1844	1926	82
Indonesia	1914	1992	78
India	1936	2003	67
Nigeria	2012	2064	52
Iraq	1989	2036	47
Niger	2036	2081	45
South Korea	1943	1977	34
Ukraine	1911	1944	33
Russia	1930	1950	20
Taiwan	1959	1977	18
North Korea	1961	1978	17
Algeria	1985	1997	12
Iran	1986	1996	10
China	1968	1977	9

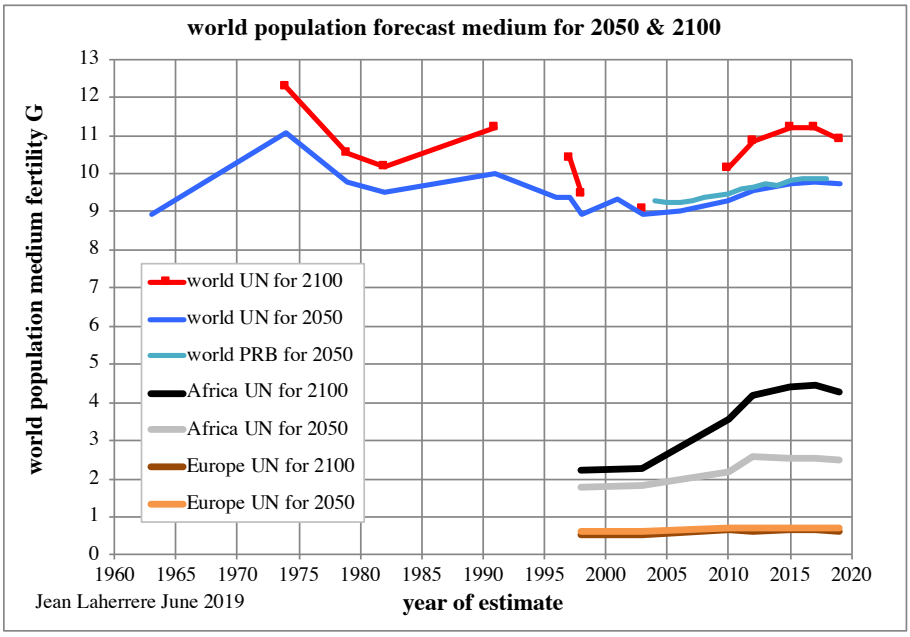
Except Niger, Nigeria & Iraq data which are from gapminder forecasts, other countries are past data!
But the decline from 5 to 2 children per woman is faster

fertility year	5 child/w	3 child/w	year
France	1790	1894	104
Spain	1853	1945	92
UK	1828	1910	82
US	1871	1926	55
India	1976	2003	27
Japan	1928	1952	24
South Korea	1957	1977	20
Germany	1898	1916	18
Russia	1932	1950	18
Ukraine	1926	1944	18
Indonesia	1975	1992	17
North Korea	1966	1978	12
Taiwan	1965	1977	12
Iran	1986	1996	10
Algeria	1989	1997	8
China	1971	1977	6

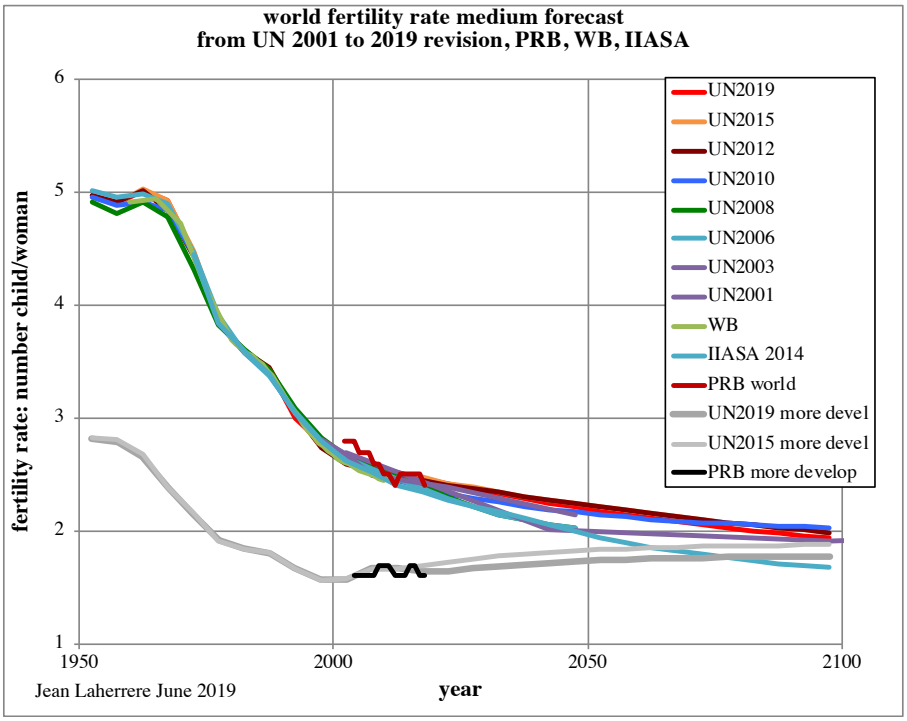
-evolution of UN population forecasts 1974-2019
The range of forecasts from 1974 to 2019 is large, showing the uncertainty of such forecasts!



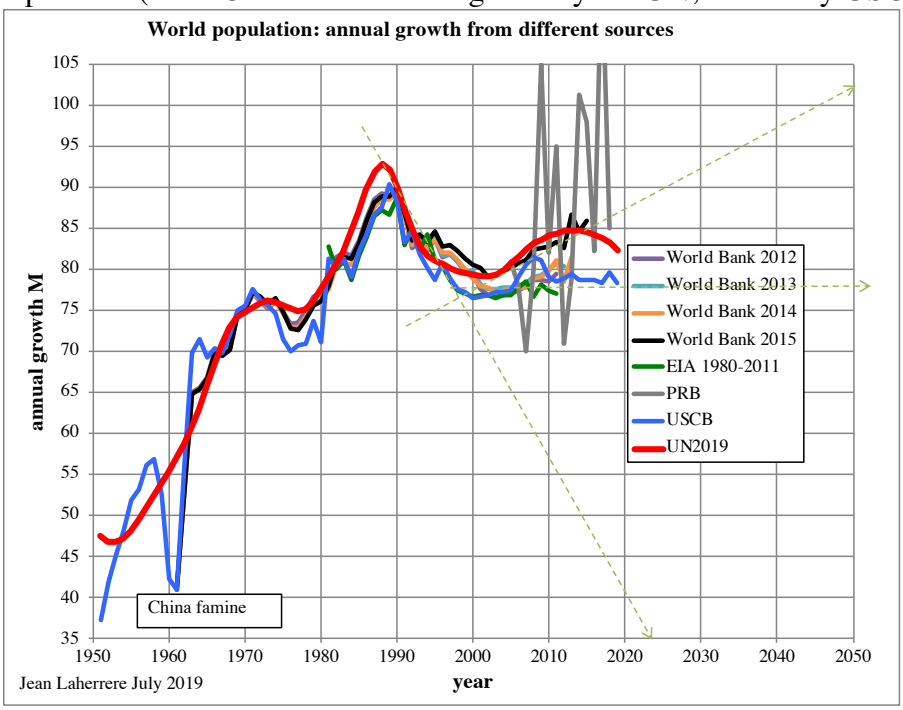
From 1963 to 2019 world population forecast for 2050 (blue curve) has varied between 9 and 11 G and for 2100 from 9 to 12 G: it is like a cycle with a peak in 1974 and 2017
The change is mainly for Africa (black curve) as forecasts for Europe (orange curve) did not change!



UN population forecasts are based on fertility scenarios which are mainly utopic with the goal for every country to be in the long term at replacement ratio of 2.1 children per woman.
The more developed countries with low fertility will grow again when the less developed will drop to the same ratio: it is utopic and contrary to facts: fertility of more developed countries is not growing!

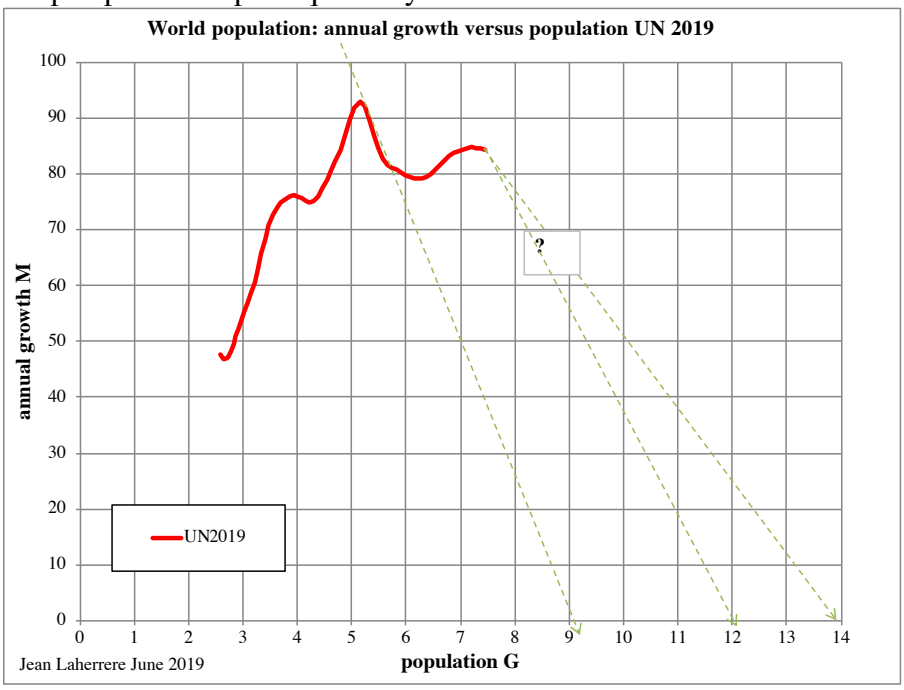


World population annual growth from different sources (UN, WB, USDOE/EIA, USCB, PRB) shows that the data is unreliable, because lack of data (no census was never carried on in Somalia) or political manipulation (1960 China famine is forgotten by the UN, but not by USCB)

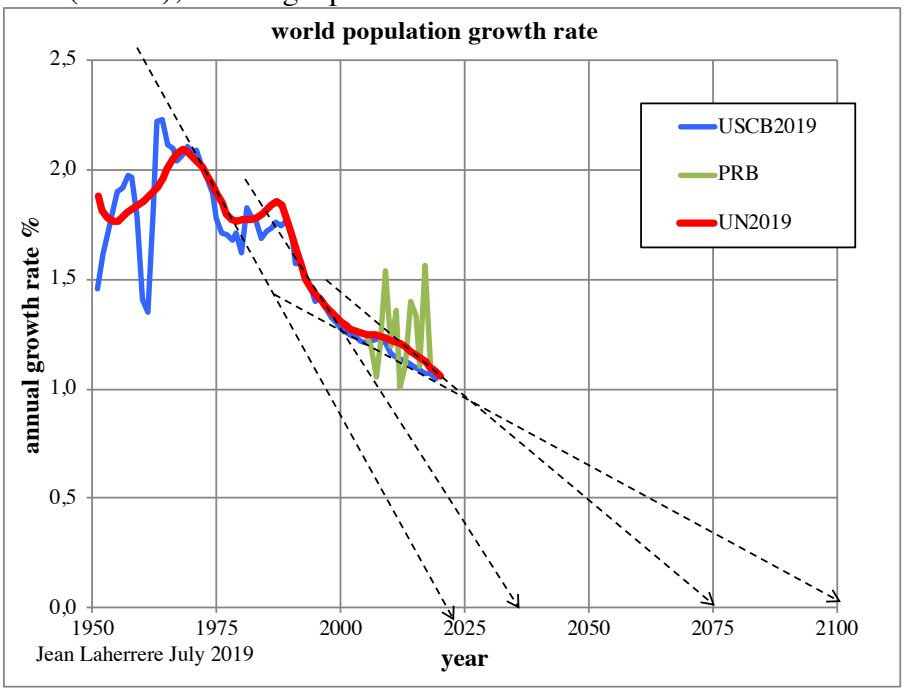


In 1990 UN estimated Nigeria at 120 M (fight between States, in particular Biafra, but also revenue allocation in the civil service), but the 1991 census with 89 M found that this estimate was too high, wrong by 30%! But the UN report many population significant digits (as other agencies), which are useless. Accuracy is never evaluated.
Nigeria last census was 2006 with 140 M, proposed 2016 census was not carried out by lacks funds.

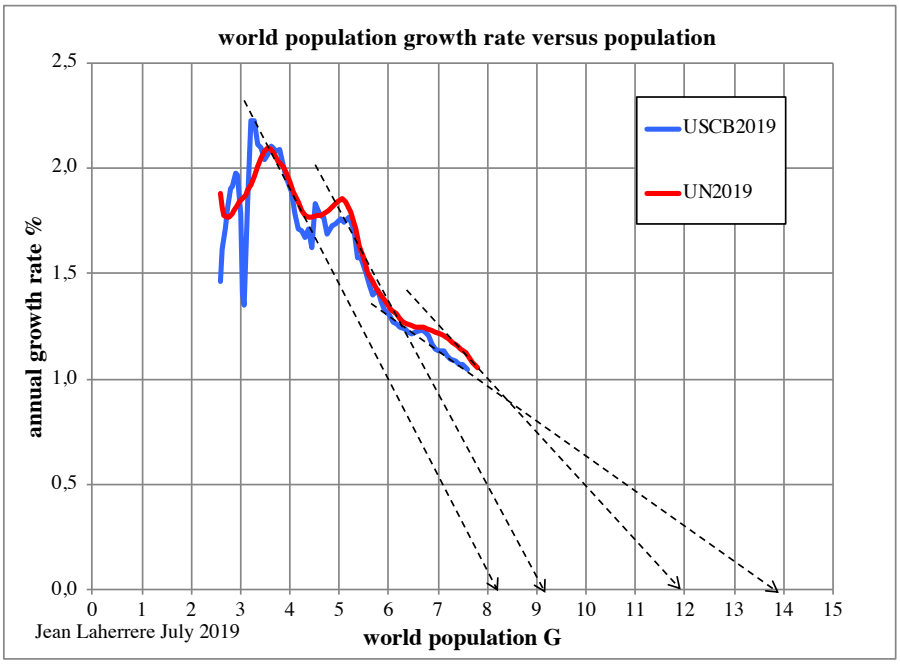
World annual growth has increased from 45 M in 1950 to a peak of 93 M in 1988. The growth decline of the period 1988-2000 was hoping to see a world peak around 2025, but the resumed growth after 2000 postpones the peak quite beyond to 2100.



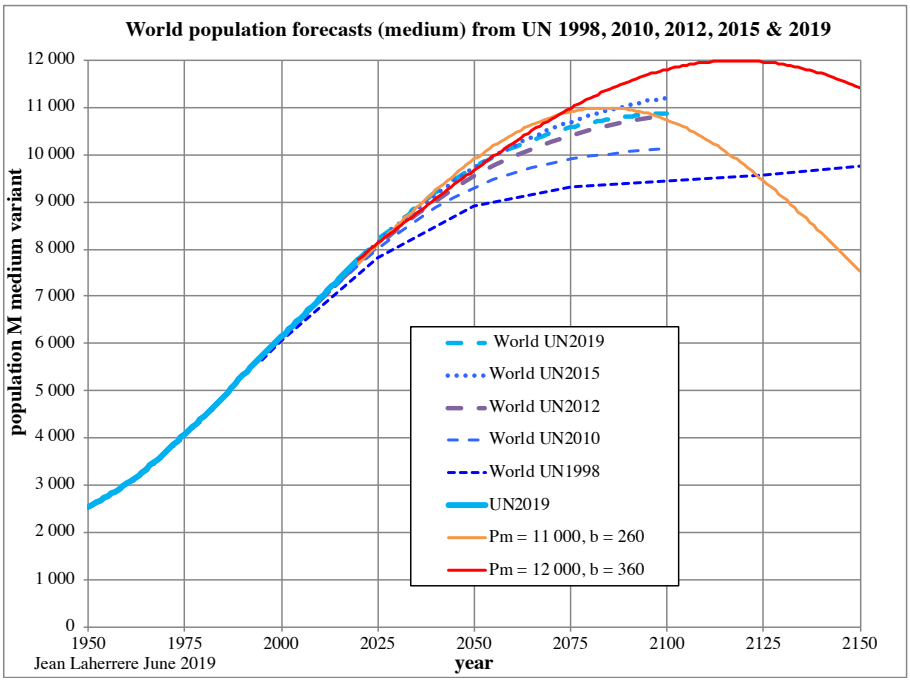
In contrary with world growth, recent world growth rate versus time could be extrapolated towards 2075 (UN) or 2100 (USCB), meaning a peak.



World growth rate versus population for the period 2010-2018 trends towards a peak of 12 G (UN) or 14 G (USCB)



UN medium fertility forecasts are plotted for the editions of 1998, 2010, 2012, 2015 and 2019 as a Hubbert model with a peak at 12 G in 2115 or a peak at 11 G in 2080, which is close to UN2019 forecast.

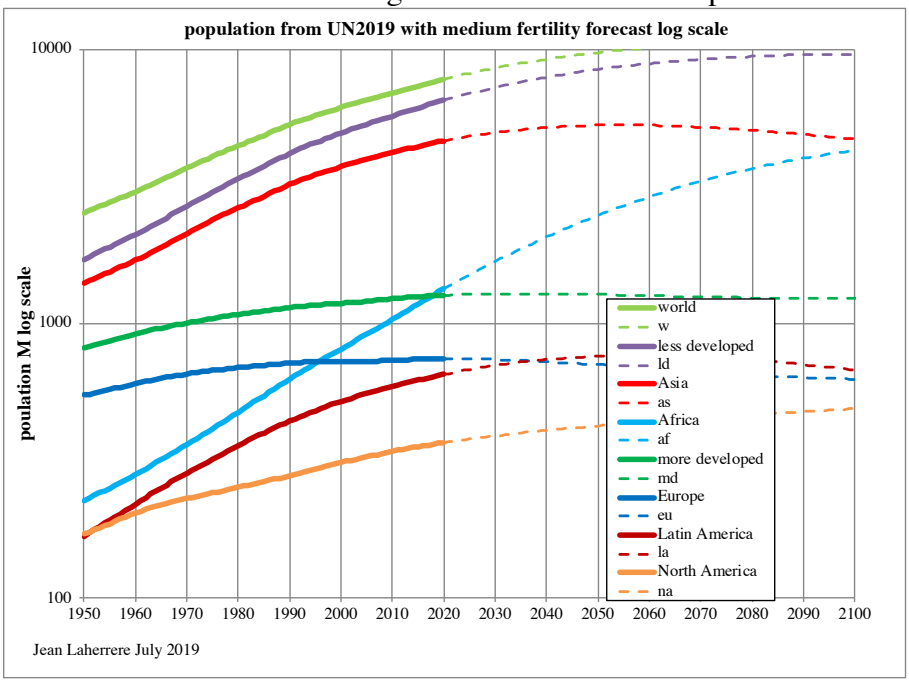


It is obvious that 1998 forecast was too low, because the UN was too optimistic on Africa fertility decline. We will see further that Niger fertility was forecasted in 1998 to be today around 6 children per woman when it is above 7!

-UN2019: world

The last UN forecast is based on the same unexplained, utopic scenarios as before.
There are several scenarios based mainly on the fertility with low, medium and high fertility rate.
We display only the medium fertility forecast.
It is always interesting to display growing curves in log scale: in the first display the growth of the world and of Asia look differently but in log scale curves are parallel, meaning same growth.

The growth of Africa is much more than the growth of the less developed countries.

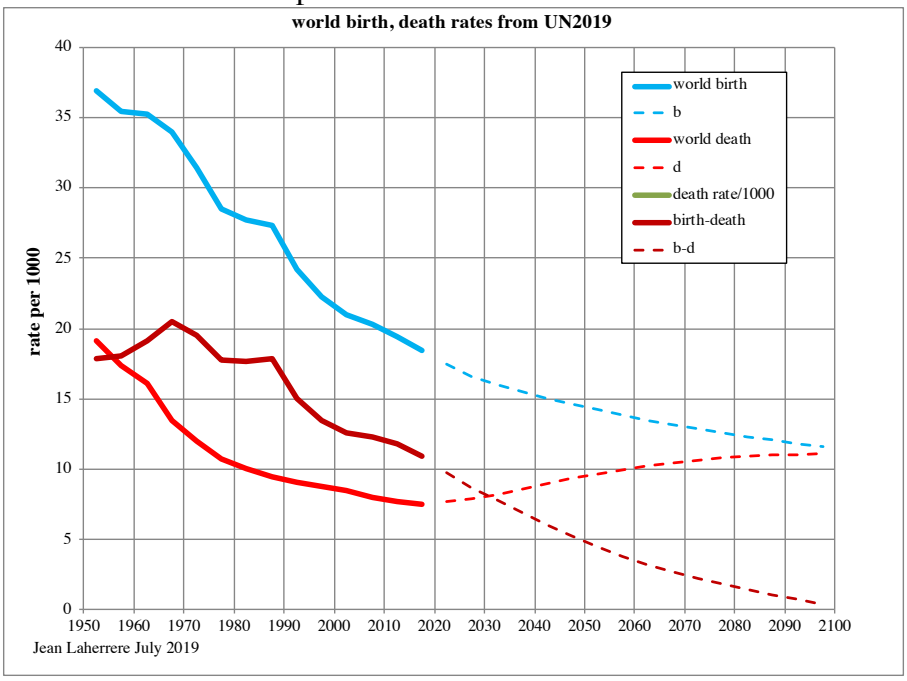


We have seen that the goal of the UN is that in the long term every country will trend towards the replacement ratio (fertility of 2.1 child per woman) leading to a constant world population: it is very unlikely.

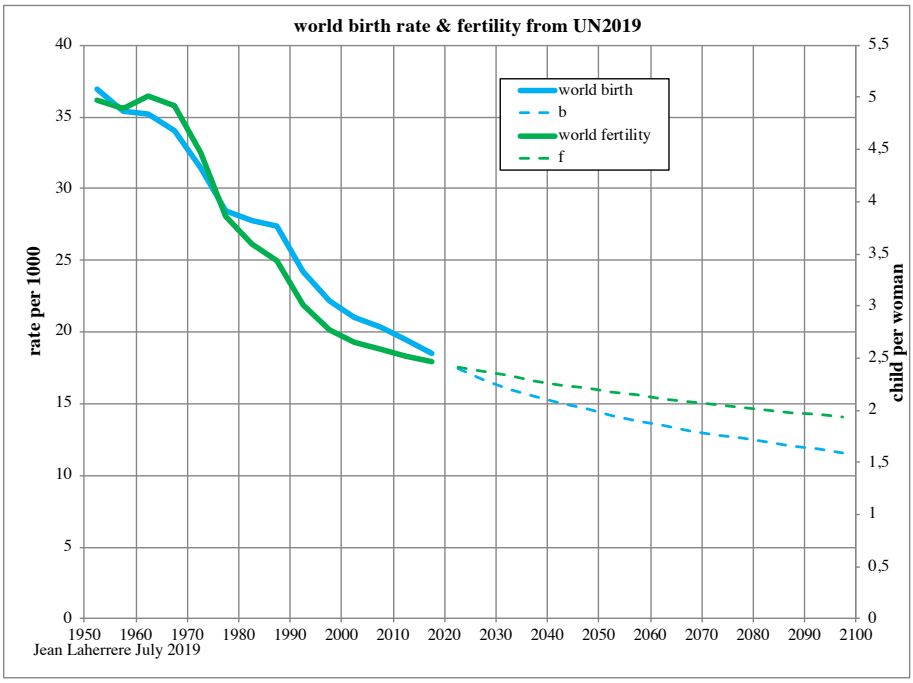
The UN2019 world birth rate is assumed to be in 2100 equal to the death rate, it is unlikely.

World birth rate is presently 18 per thousand (compared to 37 in 1950) and it is assumed to be 12 in 2100: the future birth trend is in line with the recent past since 2000.

In contrary world death rate, which was 20 in 1950 is now 7, but it is assumed to increase to 12 in 2100, just to match birth rate: it is utopic.



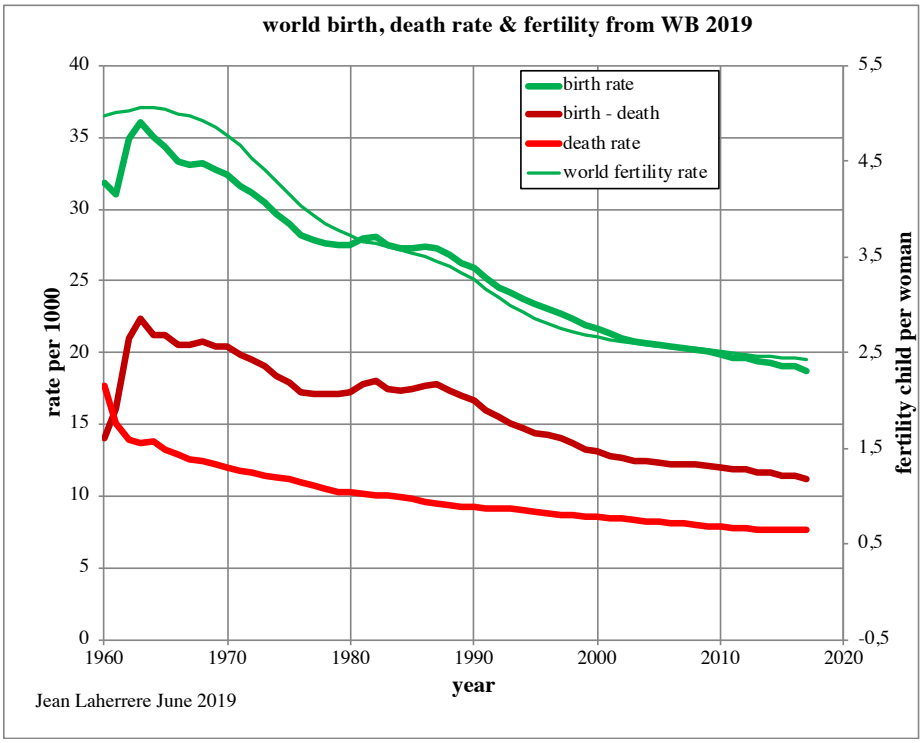
Birth rate (number per 1000 people) and fertility rate (number of children per woman) are related and the relationship is about birth rate is 7 times the fertility and it looks that birth for 2100 is too high compared with fertility



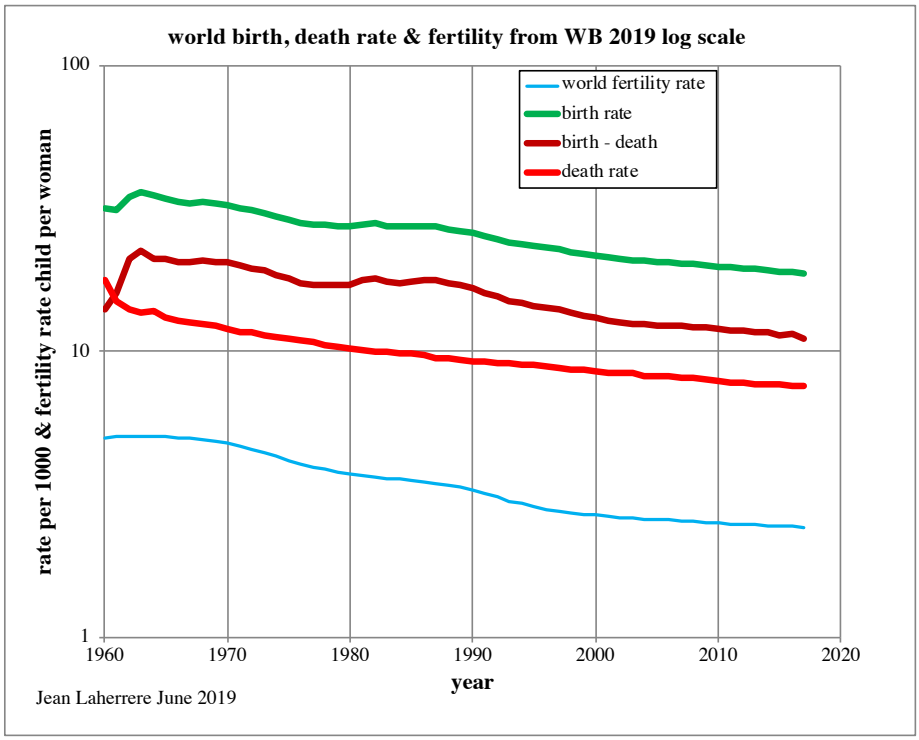
-World Bank

World birth rate from WB2019 is on decline since 1963 from 36 to 19

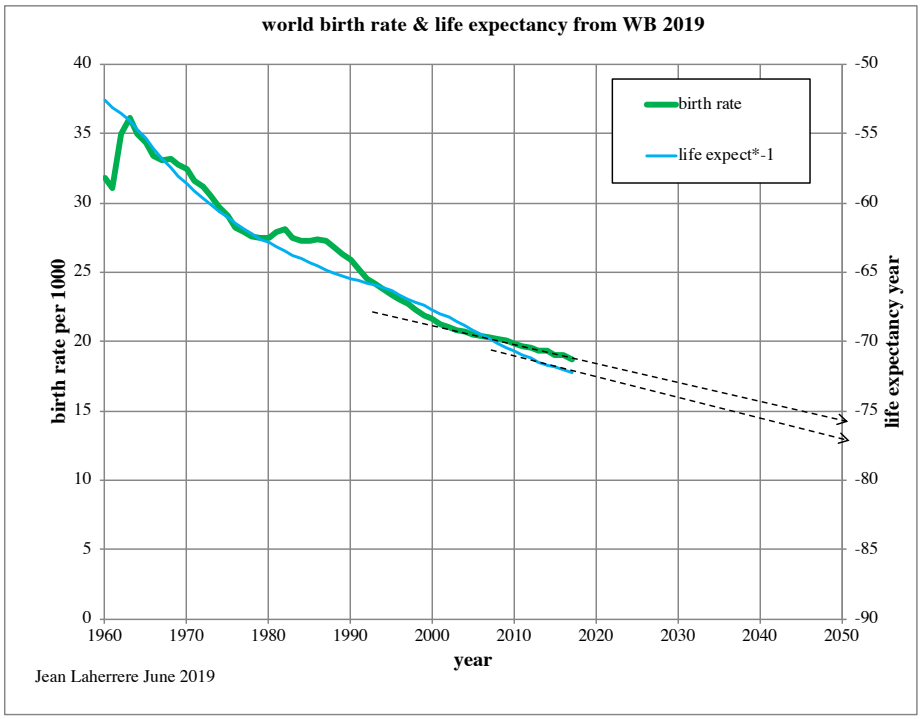
World death rate is on decline since 1960 at 18 to 8 in 2017.



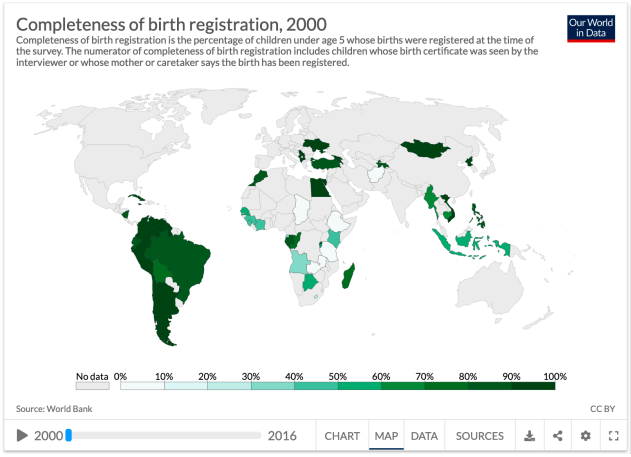
The plot in log scale shows that the decline of birth and death are roughly parallel.

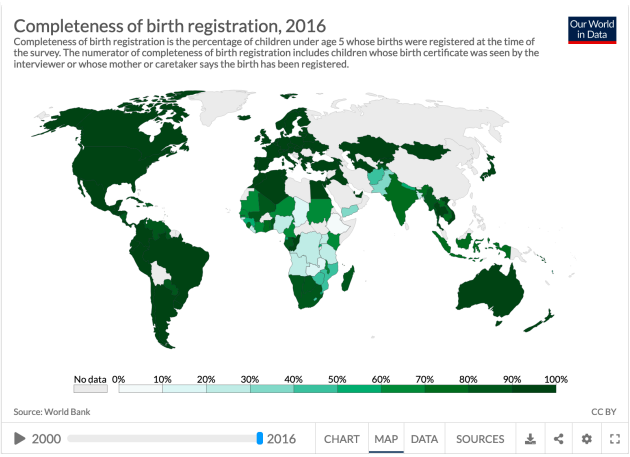


World birth rate and life expectancy multiplied by -1 display a good correlation for the period 1963-2017.



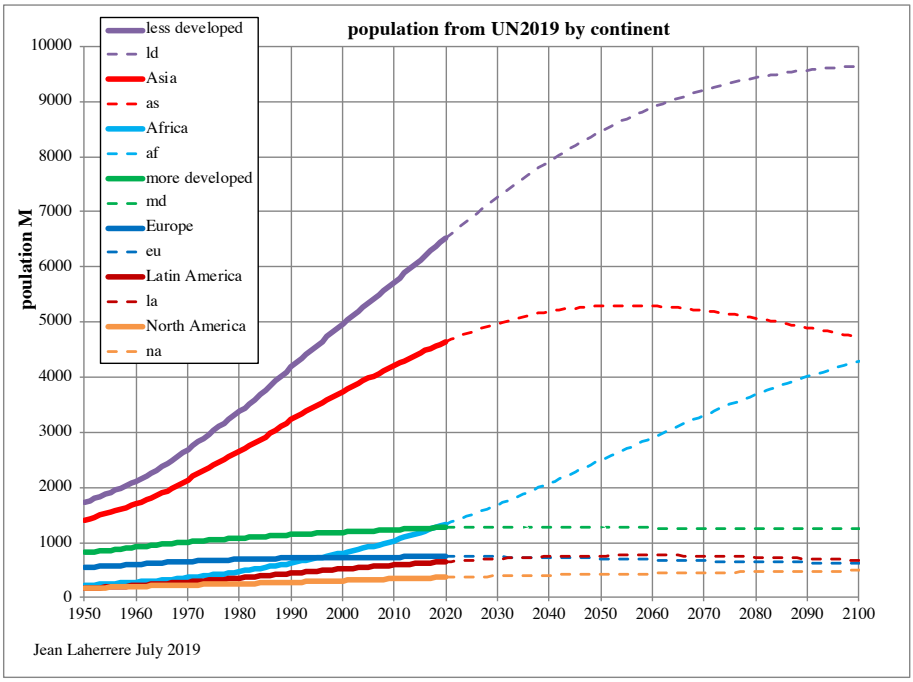
The quality of birth data is poor and uncomplete as reported by Max Roser
https://ourworldindata.org/fertility-rate
Data quality on birth



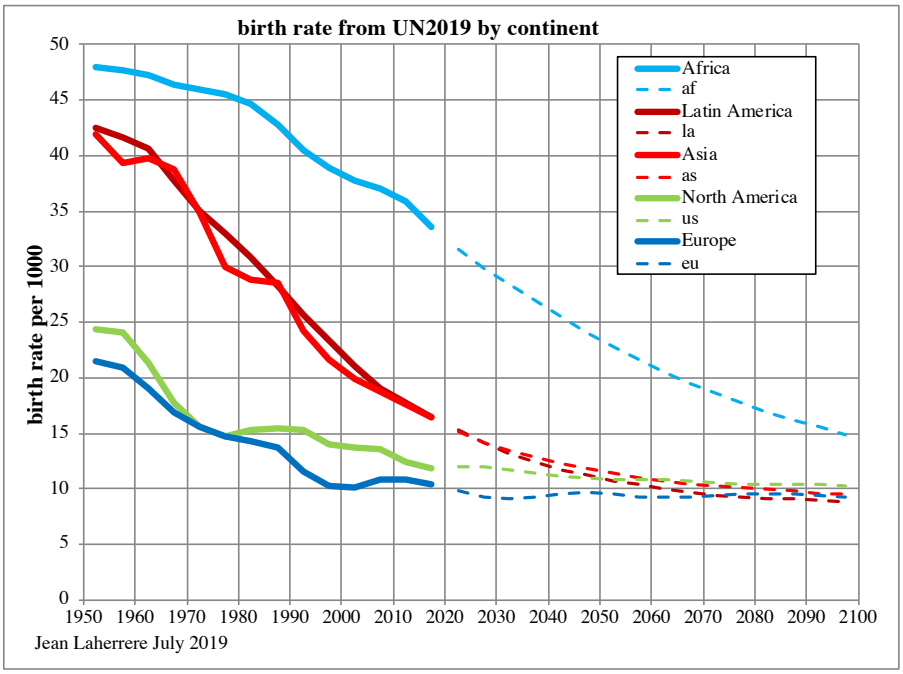


-**UN2019 per continent**

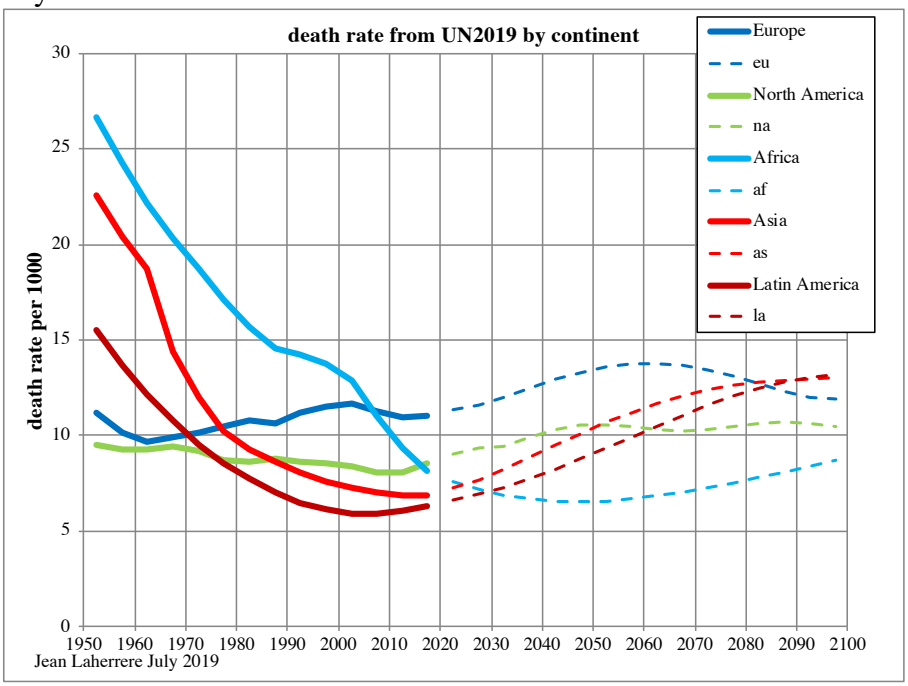
Population per continent forecasts by UN2019 up to 2100 shows that Asia, Latin America, North America and Europe will decline or stay stable when Africa will increase sharply (as less developed countries)



The birth rate per 1000 people decreases from 1950 to 2020, but there are three groups: first Africa declining from 48 to 33, second Latin America and Asia declining from 48 to 18 and third North America and Europe declining from 25 to 10. It is why Africa population is bursting.
For 1950-2020 birth rate is similar with Europe and North America (going from 22 to 12) and with Latin America and Asia (going from 42 to 17) and Africa is different (going from 48 to 33).
UN medium scenario is that in 2100 Europe, North America, Latin America and Asia will have the same birth rate of 10 and that Africa is trending towards 10 around 2150.

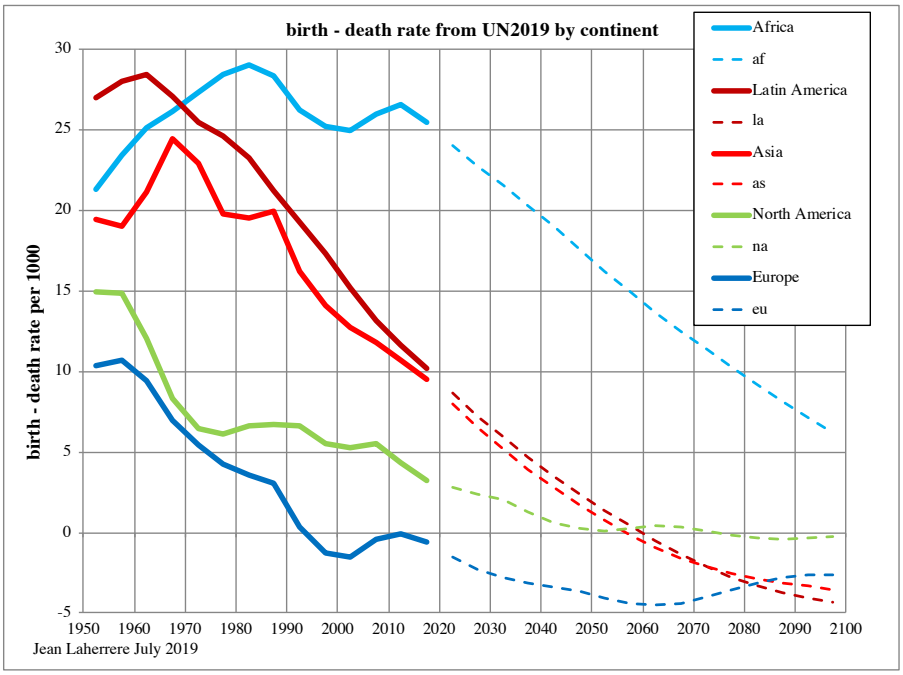


UN forecasts that all continents trend towards a birth rate of about 10: is it based on fact or on utopia (equality for all despite a different past!)?
From UN2019 the death rate per 1000 people is almost flat for Europe and North America since 1950, for Asia and Latin America since 2000, and declining for Africa.
But today death rate is the highest in Europe at 11 and the lowest in Latin America at 6, with Africa at 8. Why equality for future birth rate between continents but not for death rate?

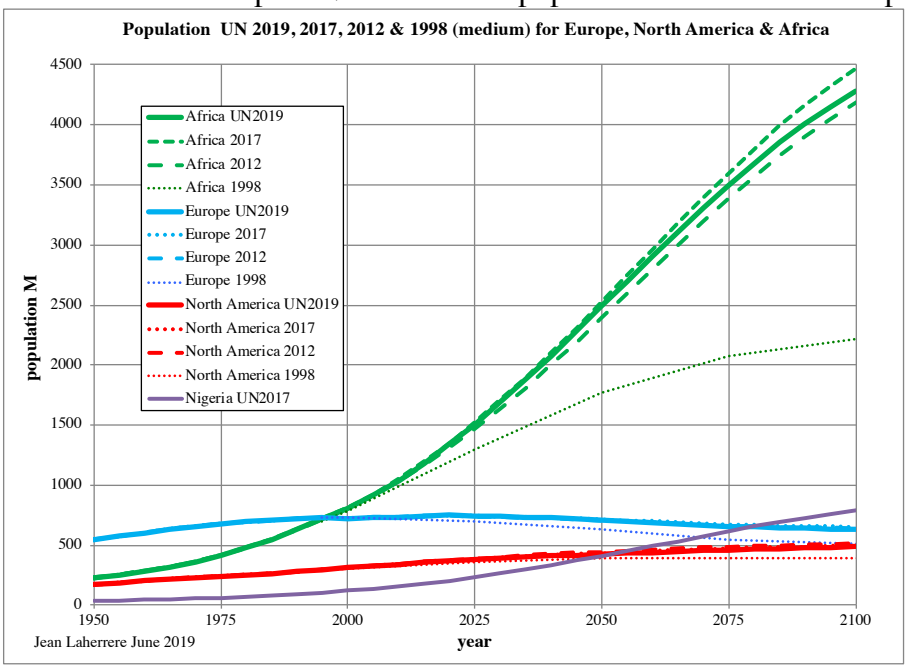


But UN forecast assumes a death rate increase from 2020 to 2050 for all continents except Africa?

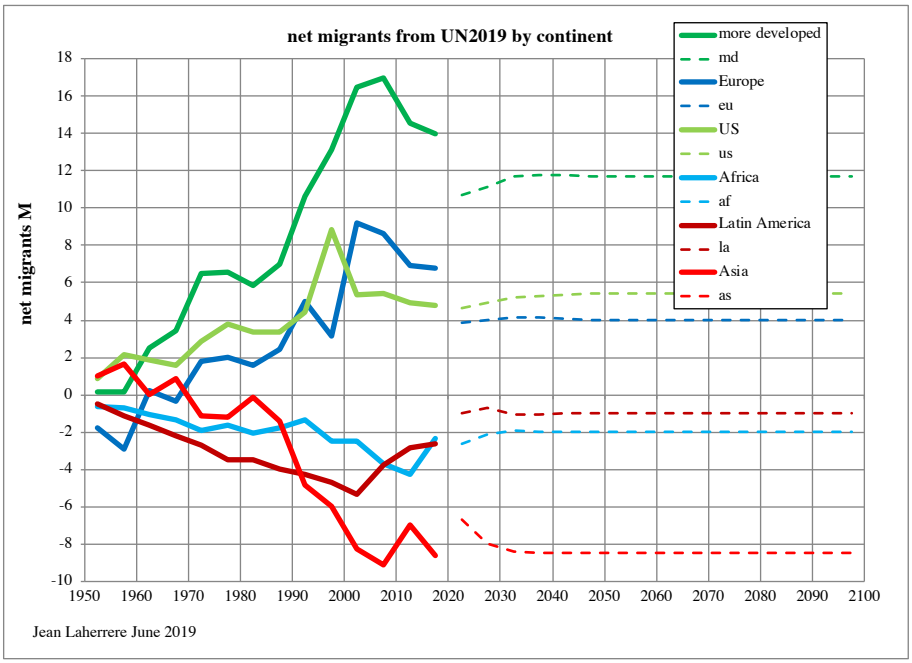
The natural change, being birth rate - death rate is presently about 25 for Africa, 10 for Latin America and Asia and presently 8 for North America and 0 for Europe. Europe, contrary to other continents is assumed to increase birth-death after 2065?



The comparison of Africa medium forecast in 1998 and 2019 is striking: about double, because a too optimistic decline in fertility, when forecasts for Europe and North America hardly changed. Nigeria population alone will overpass North America population in 2050 and Europe in 2080!



We have some doubts on the UN fertility scenarios, but no doubt on UN net migrants' flat scenarios from 2030 to 2100: they are wrong!
It is obvious that high fertility population will migrate towards low fertility population, as Europe; We have seen on page 1 that 50 to 80 % of the world population will trend towards extinction: it means large migration.

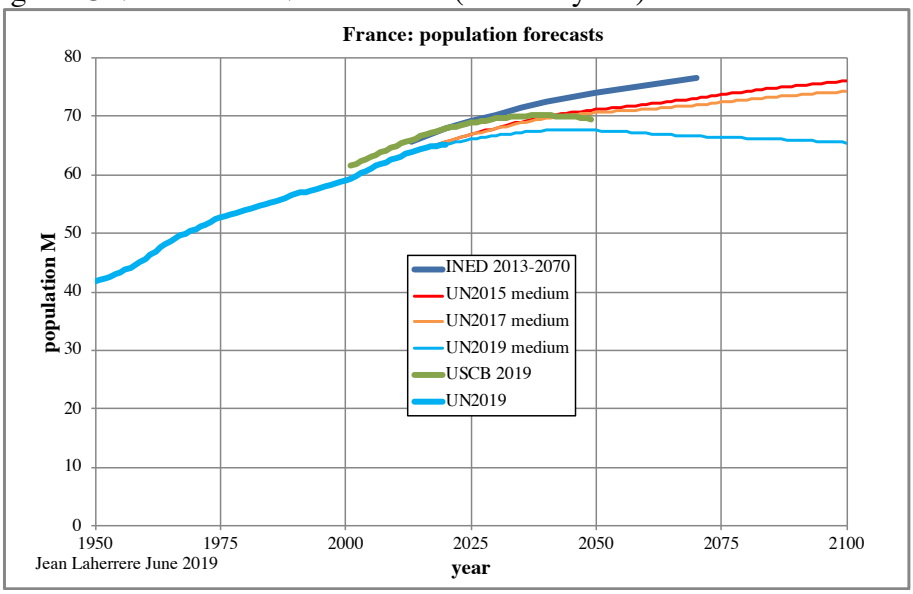


UN2019 forecast for migration flat from 2030 to 2100, shows that the authors are unable to forecast anything reliable and the estimates for 2020-2028 are doubtful.

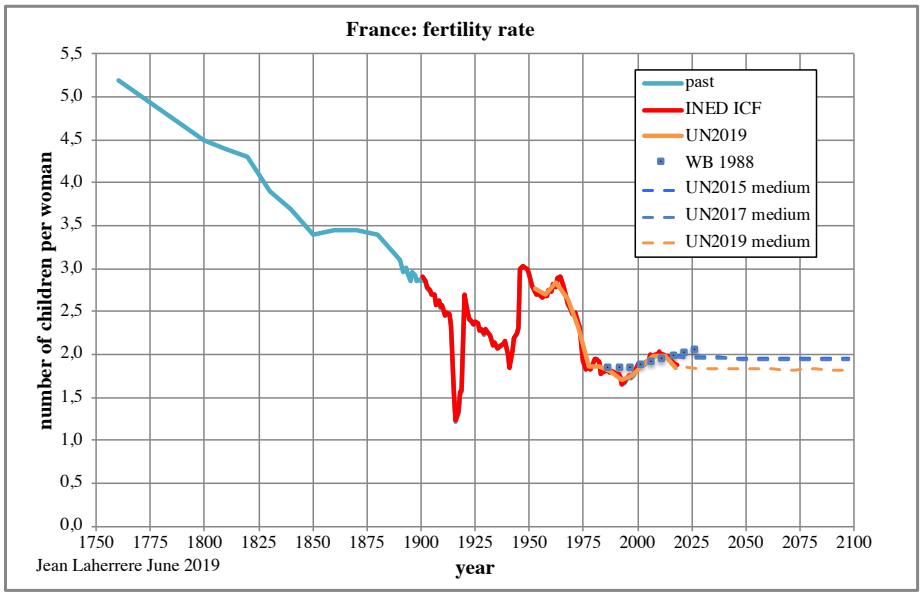
-**France**

UN2015 medium forecast for 2100 is 10 M higher than UN2019

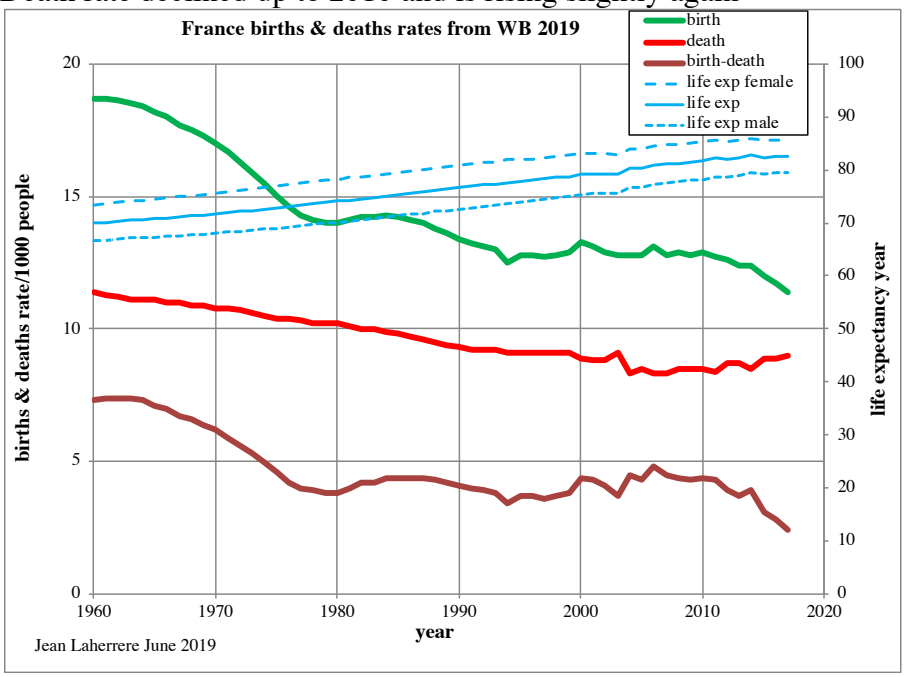
Why such change in UN forecast? INED forecast (with Mayotte) 2013-2070 is in line with UN2015



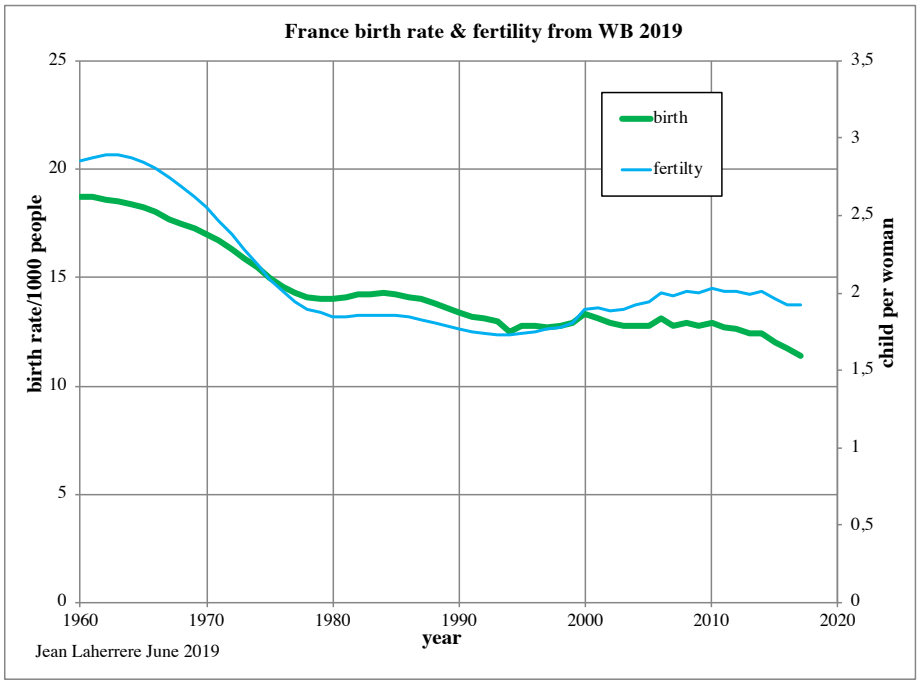
France was the first country to reduce fertility before the Revolution of 1789: the decline was almost linear (except the First War) down to the Second War: after the Baby Boom (1945-1975) corresponding with the Thirty Glorious, the fertility was less than 2 children per woman, but succeeded to reach over 2 from 2008 to 2012, but actually at 1.9. UN2019 forecasts a flat fertility at 1.83 up to 2100: it is a pure guess and the proof of incertitude.



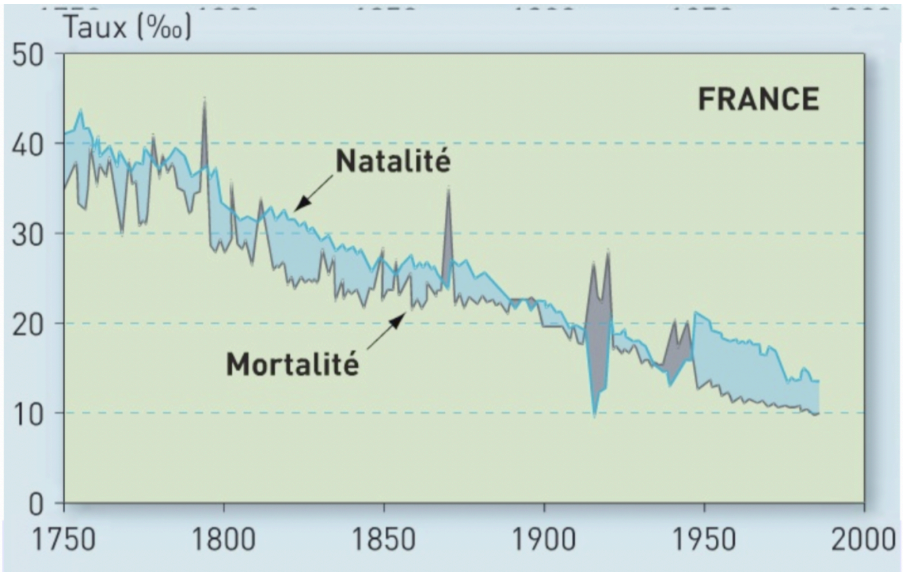
WB reports the birth and death rates from 1960 to 2017: birth rate declined from 1960 to 1979 and 2010 to 2017. Death rate declined up to 2010 and is rising slightly again



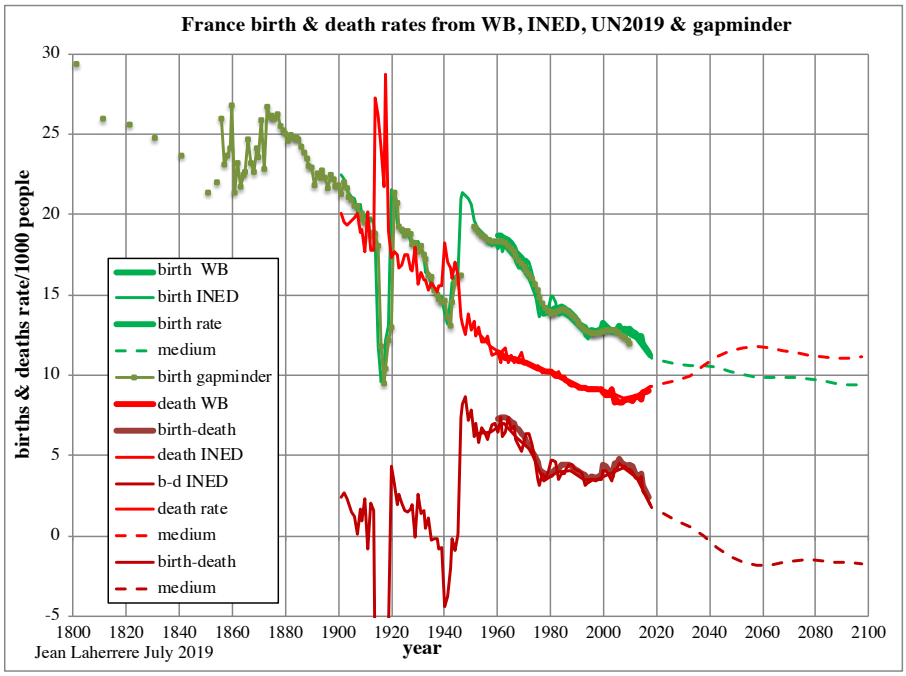
WB2019 reports birth and fertility, they vary together but difficult to convert one in another



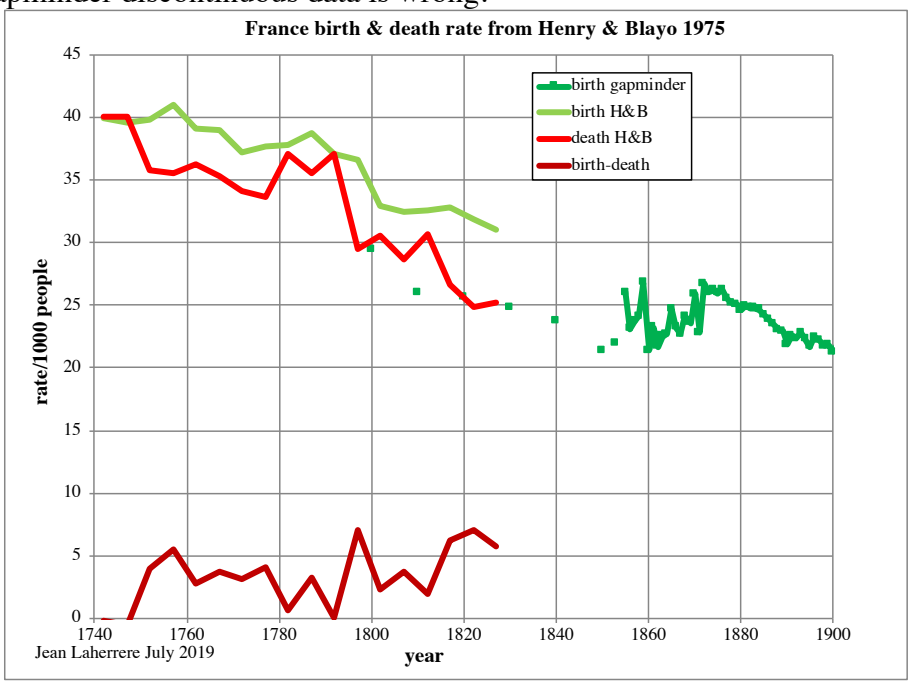
JM Decroly homepages.ulb.ac.be/~jmdecrol/Upload_enseignement/SOCAD551_ChIIPP.pdf in « la transition democratique » reports France birth and death rate (/1000) and in contrary with the model both varies together



Gapminder reports birth rate since 1800 but their values look wrong up to 1853, being too low, compared with Henry & Blayo data.
The baby boom is sharp on birth rate from 19456 to 1976. After 1976, birth and death rates vary in line up to

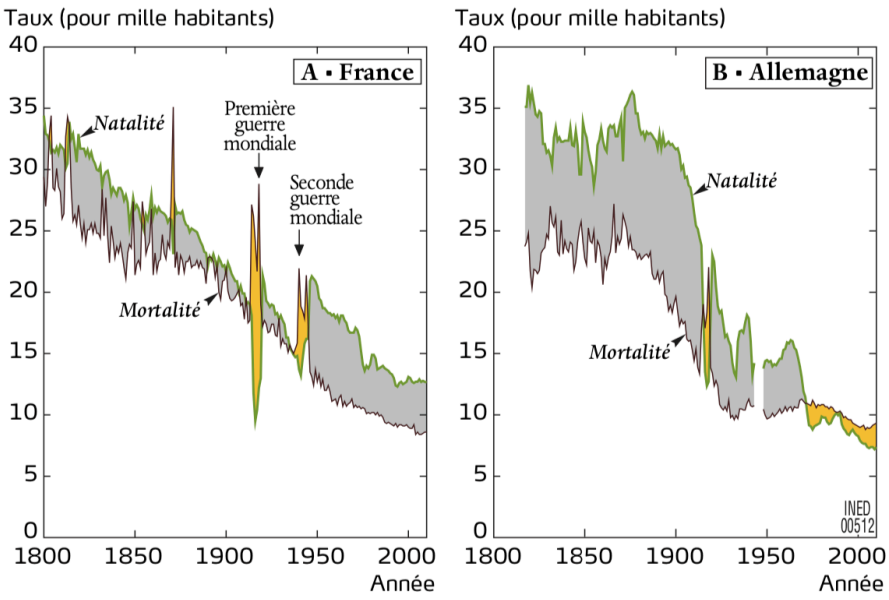


Henry and Blayo birth data on the period 1742-1827 are in line with gapminder data after 1850, before 1855 gapminder discontinuous data is wrong.



G. Pison 2012 confirms continuous declining birth rate from 1810 to 1855 for France in his comparison with Germany: it is obvious that the demography transition is different for each country.

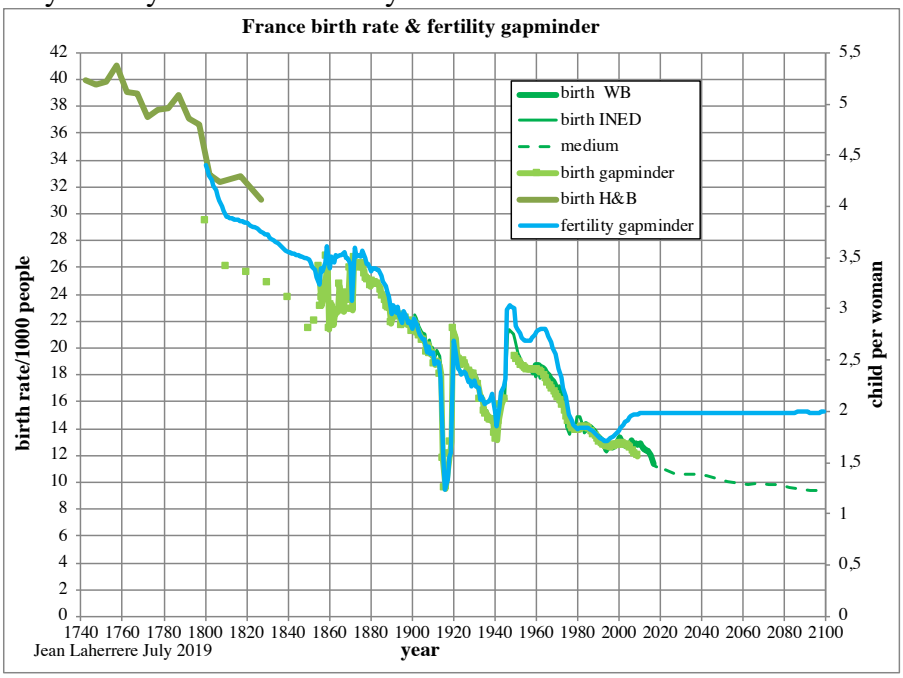
Figure 2. Évolution des taux de natalité et de mortalité depuis 1800



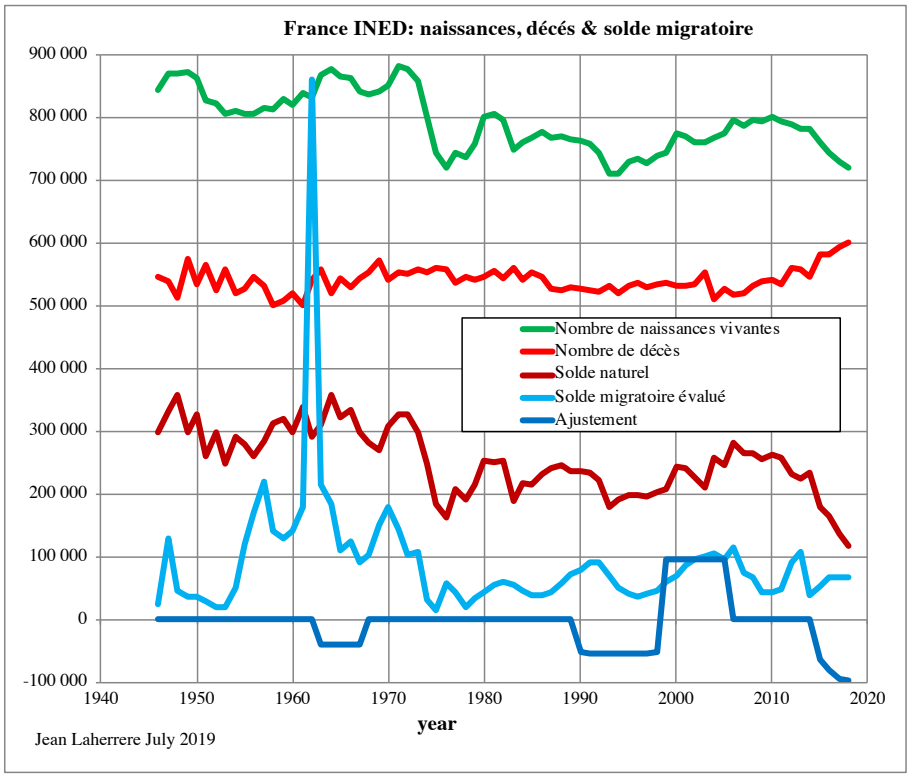
Note : pour l'Allemagne, les taux correspondent au territoire de l'époque (au Reich jusqu'en 1943, à l'Allemagne dans ses frontières actuelles à partir de 1948).

Sources : Insee, BIB. (G. Pison, *Population et Sociétés*, n° 487, Ined, mars 2012)

It is likely that gapminder fertility data for France is also wrong from 1800 to 1855, too low, compared to Henry & Blayo and with fertility!

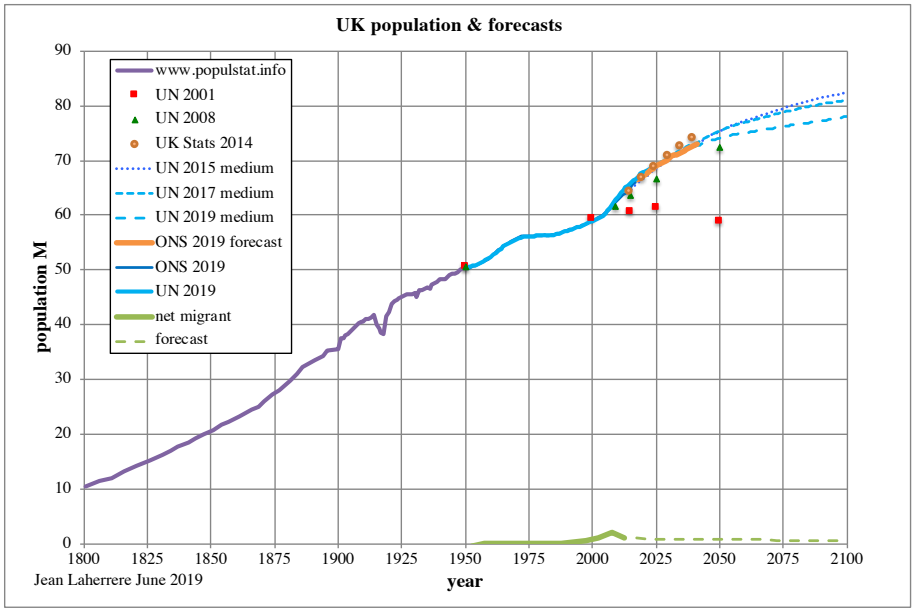


INED reports births, deaths and net migration, but there is an important adjustment variation. Migration is a political matter and presently badly reported (value of the adjustment).
The return of many Pieds-Noirs at Algeria independence is a landmark. The obvious decrease in births at the end of the Thirty Glorious is the end of the baby boom.

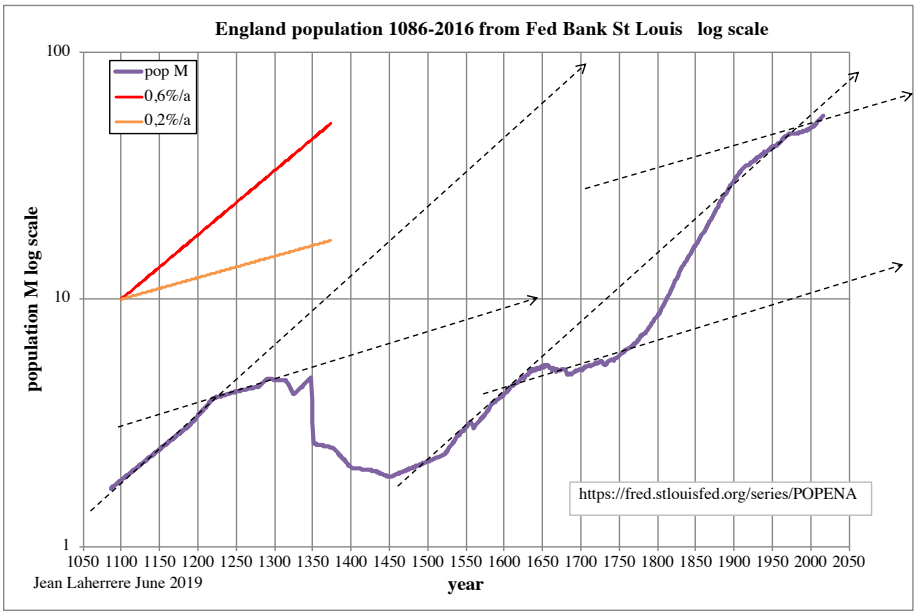


-UK

In contrary with France, UN2019 forecasts that UK population will grow up to 2100 (contrary with UN2001)



England population since 1086 from the federal bank of Saint Louis https://fred.stlouisfed.org/series/POPENA shows that climate change with beginning of the Little Ice Age = 1350 = Black Death has a strong impact on population: a graph in log scale allows to compare growths and two slopes (0.6 and 0.2 %/a) can be seen during this millennial.



Bardi shows the same Seneca cliff in Europe population with the great Plague in 1350 & 1650
https://jpopsus.org/full_articles/bardi-vol2-no1/

> population collapses. A good example, here, is the effect of the "black death" in Europe during the Middle Ages.

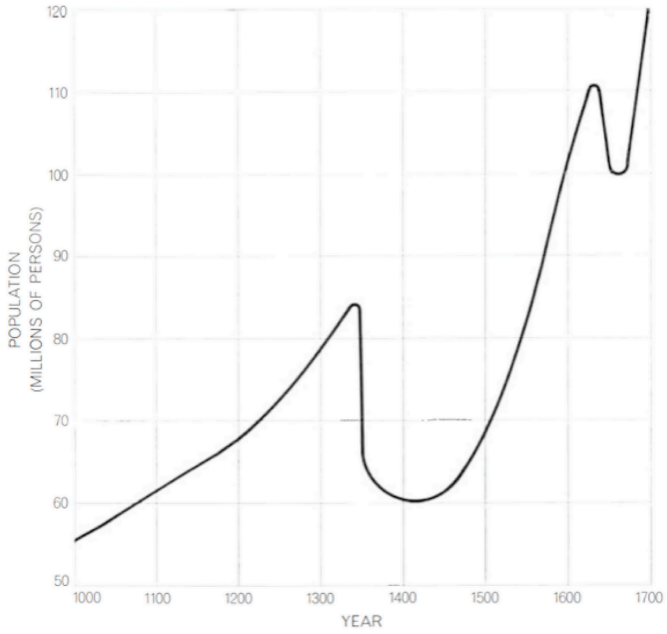
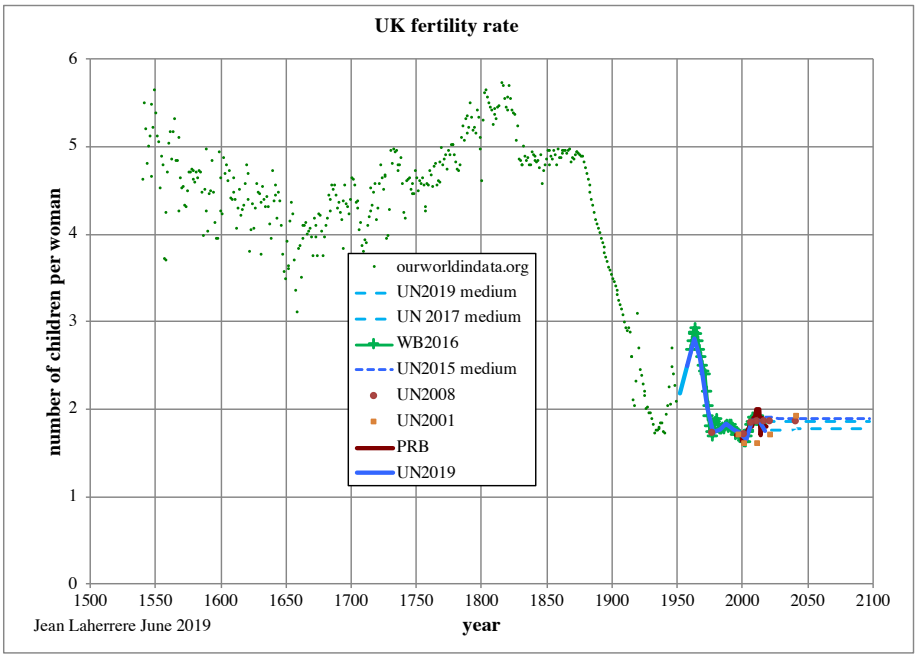
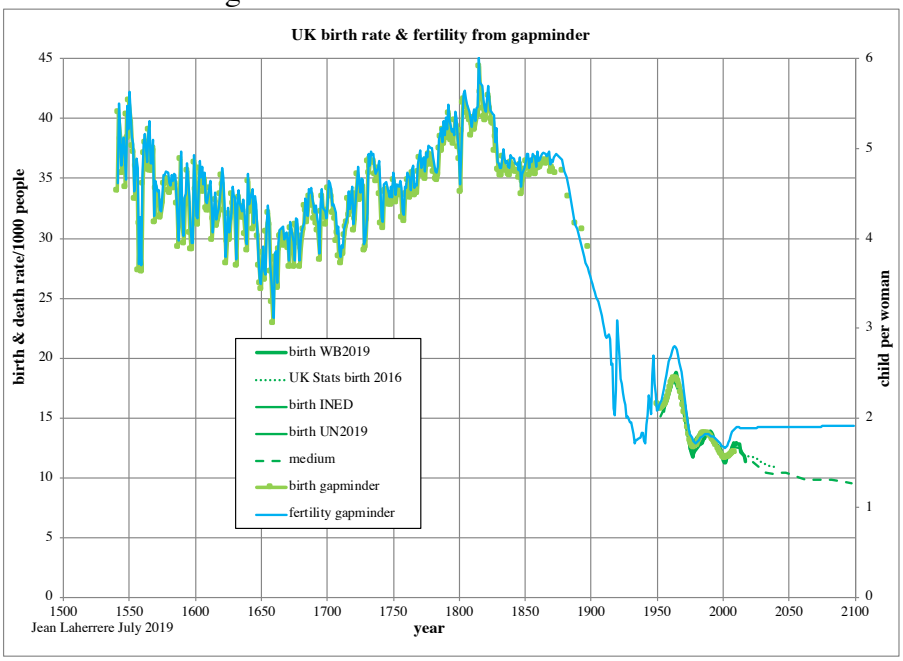


Figure 6 – European Population at the time of the Great Plague (from Langer 1964)

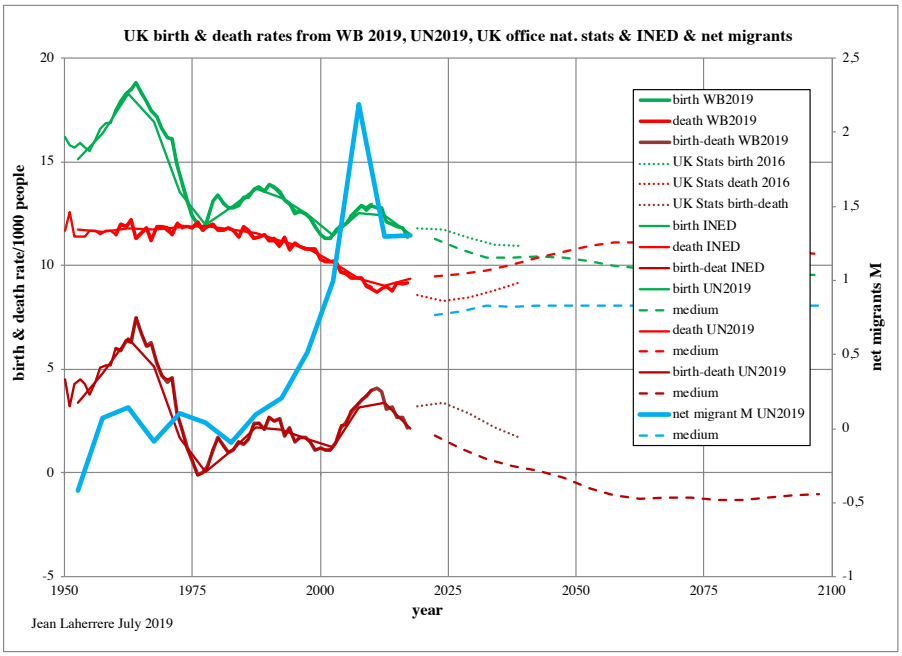
UK fertility rate since 1540 displays a low around 4 children per woman in 1650 (Great Plague) then a peak at 5.7 in 1815 and a sharp decline starting in 1875.



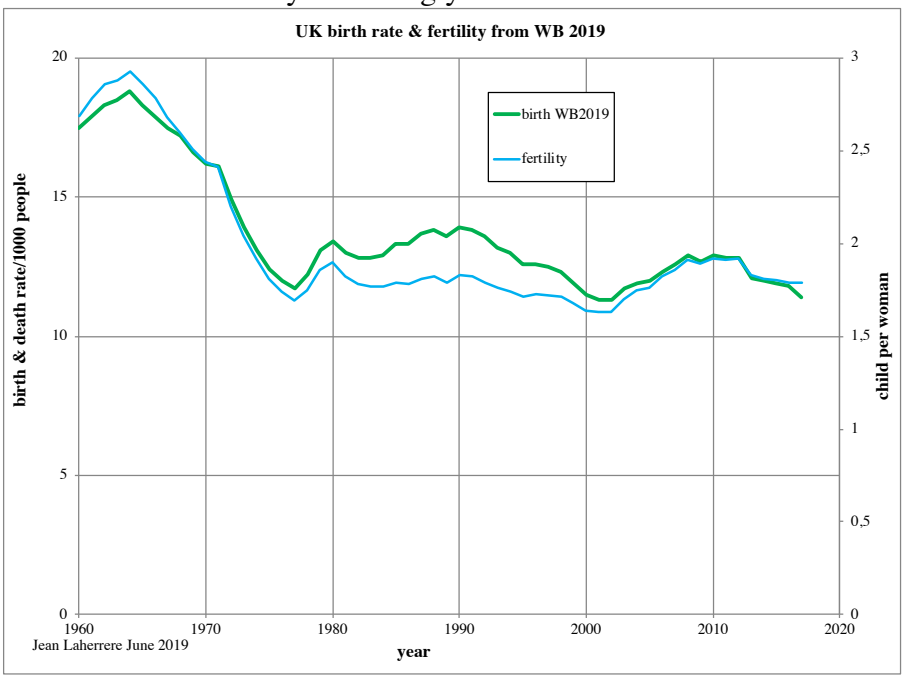
UN2019 forecasts up to 2100 a fertility of 1.9 children per woman, less than replacement but an increase in population due to migration



UN2019 forecasts for medium a negative birth – death past 2040, but a positive constant net migration (0.9 M) up to 2100 (in blue): negative Brexit is not forecasted, as population is scheduled to increase up to 2100!



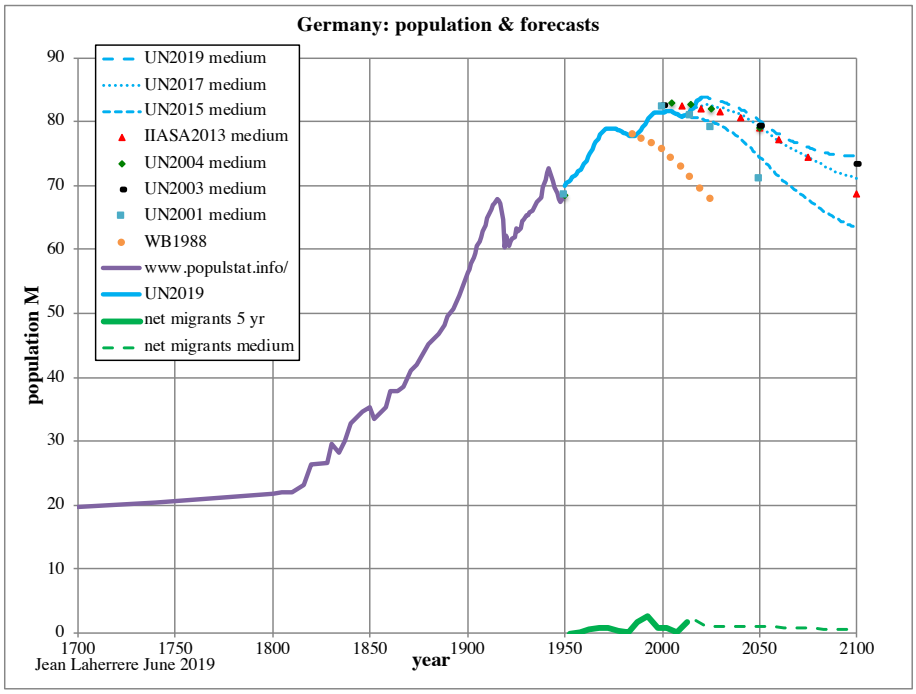
Fertility and birth rates from WB vary accordingly!



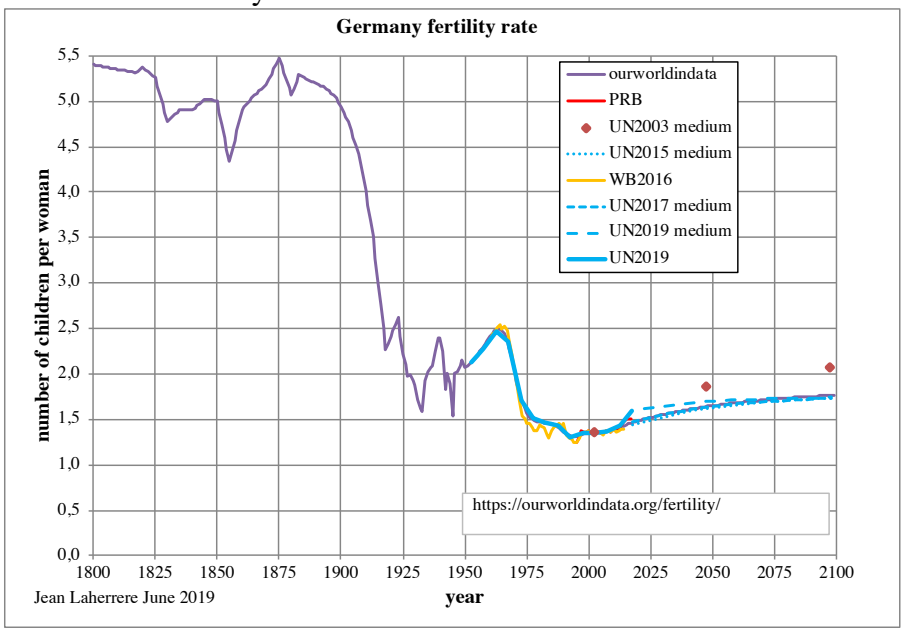
-**Germany**

Germany population was forecasted to peak in in 1974 by WB 1988, in 2015 by UN2015 and in 2022 by UN2019.

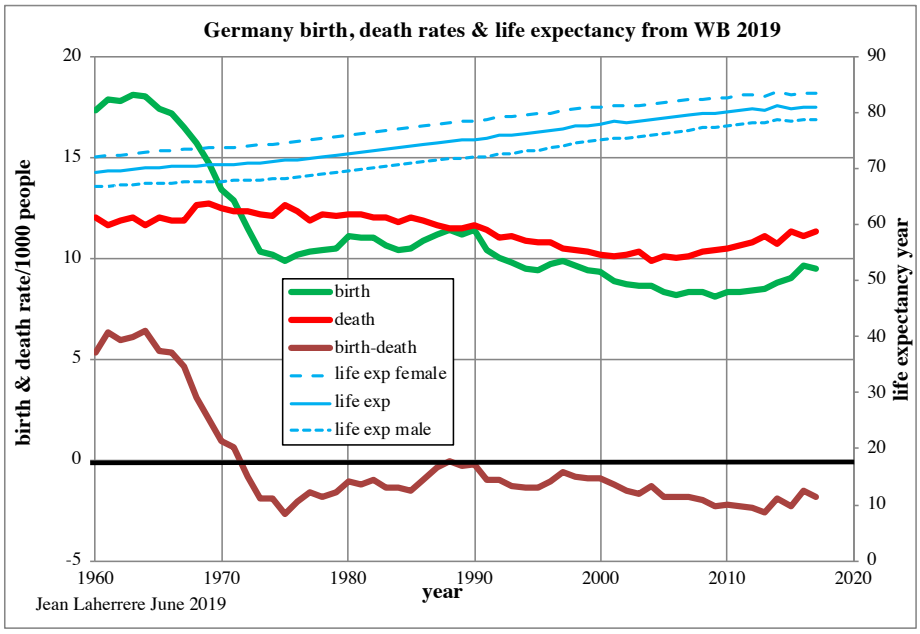
Net migrants' volume from UN2019 since 1950 is small.



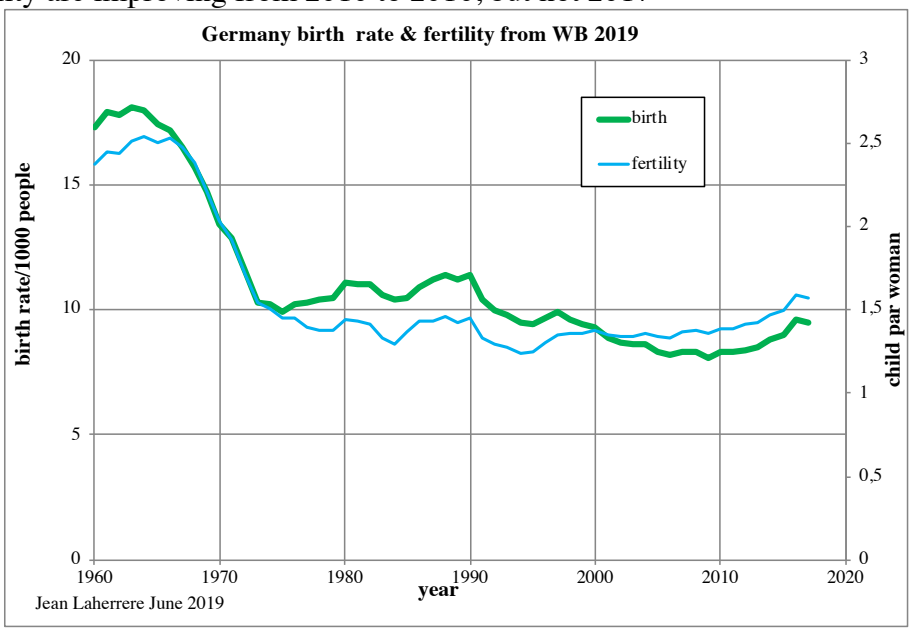
Fertility rate dropped sharply from 1900 to 1933, peaked at 2.5 children per woman in 1962, went to a low of 1.3 in 1990 and is today at 1.6



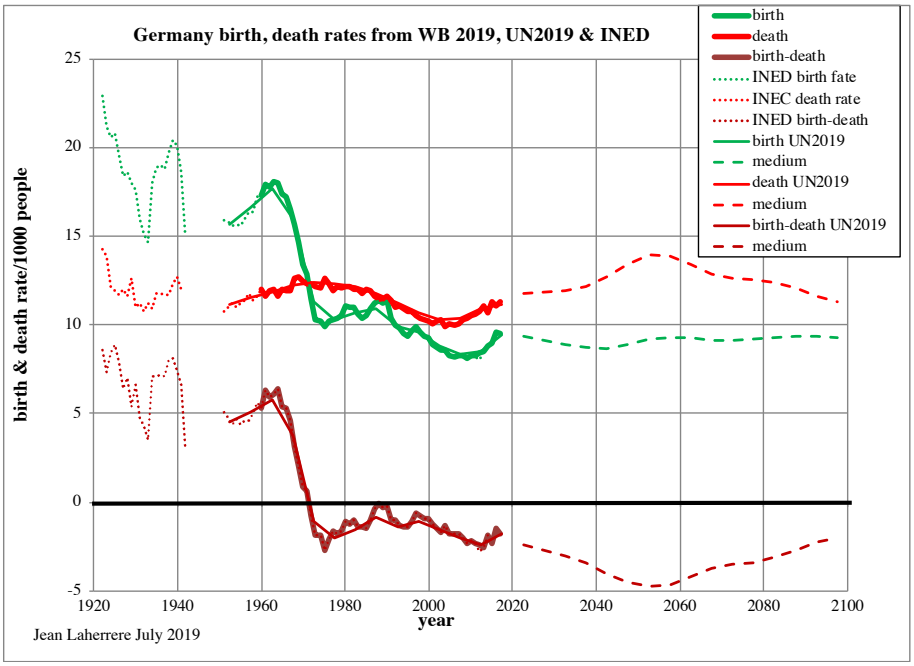
Germany birth and death rates from WB2019 are almost flat since 1975



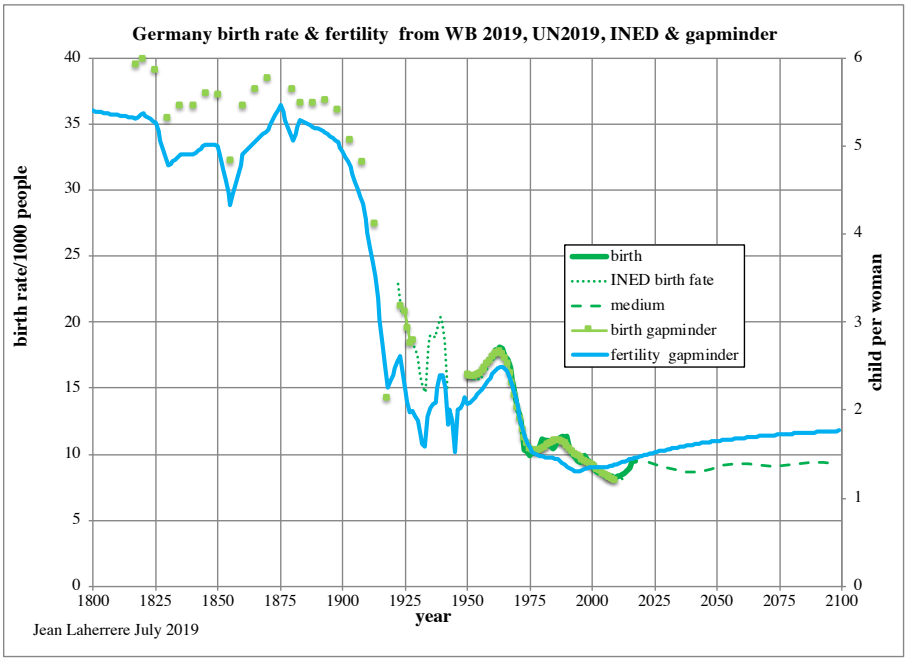
Birth and fertility are improving from 2010 to 2016, but not 2017



UN2019 forecasts that birth will stay level for the next 80 years, but death rate will go up and down after 2050 (as France & UK)



Germany fertility rate dropped sharply from 5 to 2 children per woman from 1900 to 1927 and again from 2.5 in 1965 to 1.5 in 1977, then to 1.25 in 1995 and in 2017 at 1.57 and forecasted to increase to 1.74 in 2100?



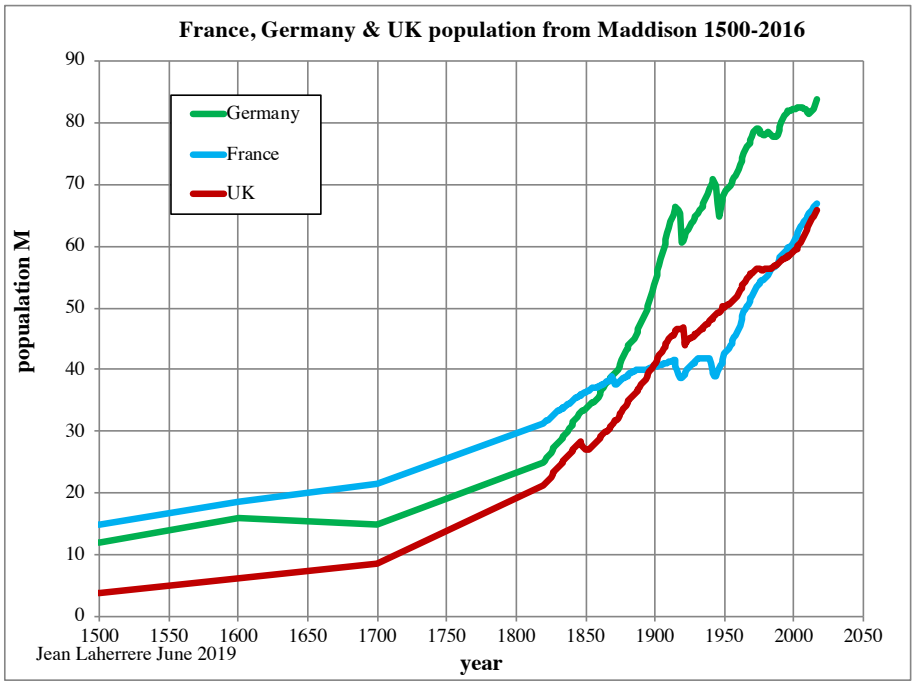
-France, UK & Germany comparison

France, UK & Germany population forecasts are compared first on the period 1500-2016 and second on 1950-2300

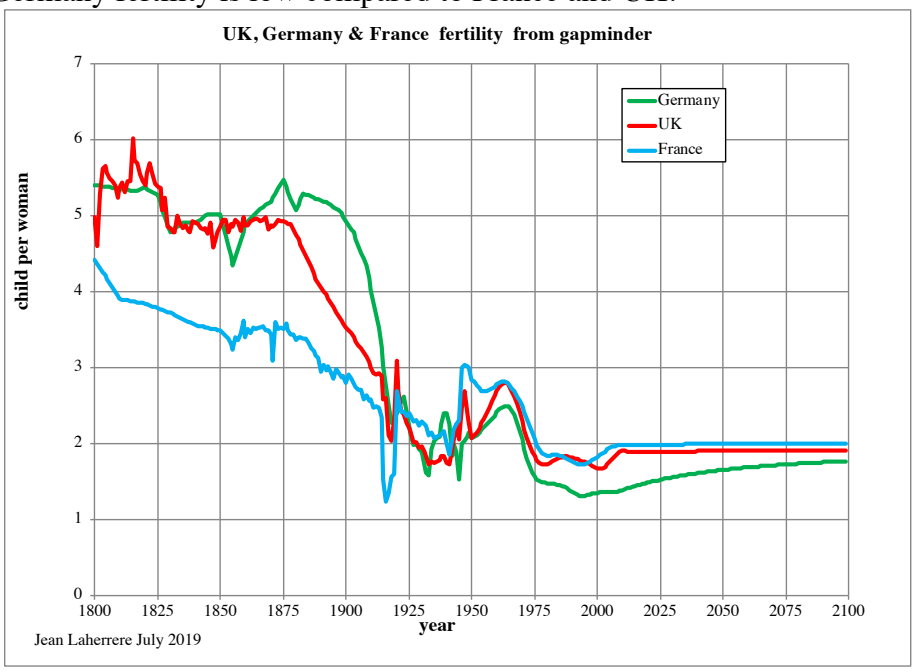
Napoleon was able first to fight other European country because France was much more populated than Germany and UK, he was beaten when they join forces.

But France was the first country to reduce sharply her fertility

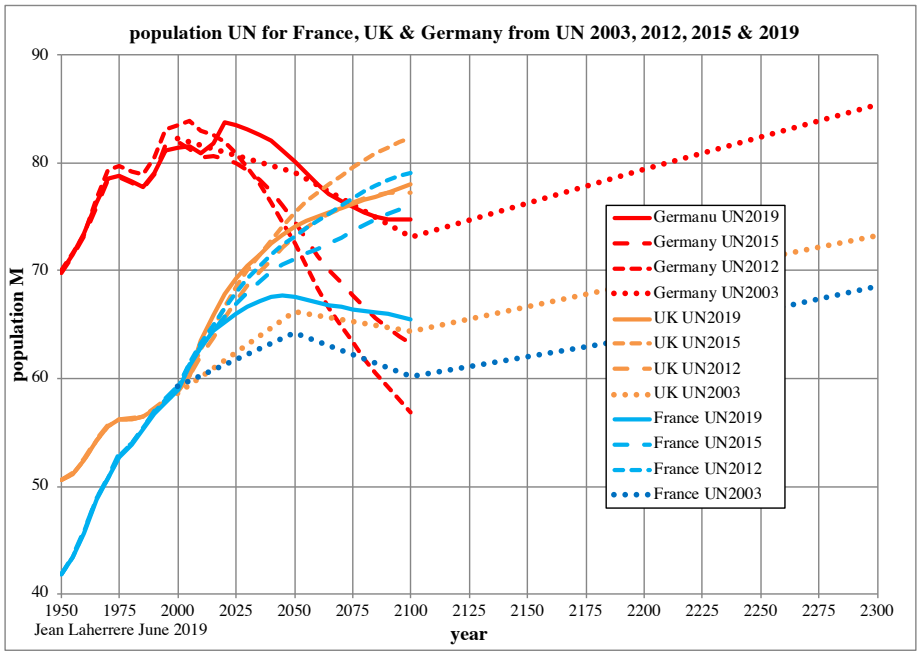
Germany increased population sharply from 1815 to 1914



After the First War to 1975, fertility of the three countries were close, compared with the past, beyond 1975 Germany fertility is low compared to France and UK.



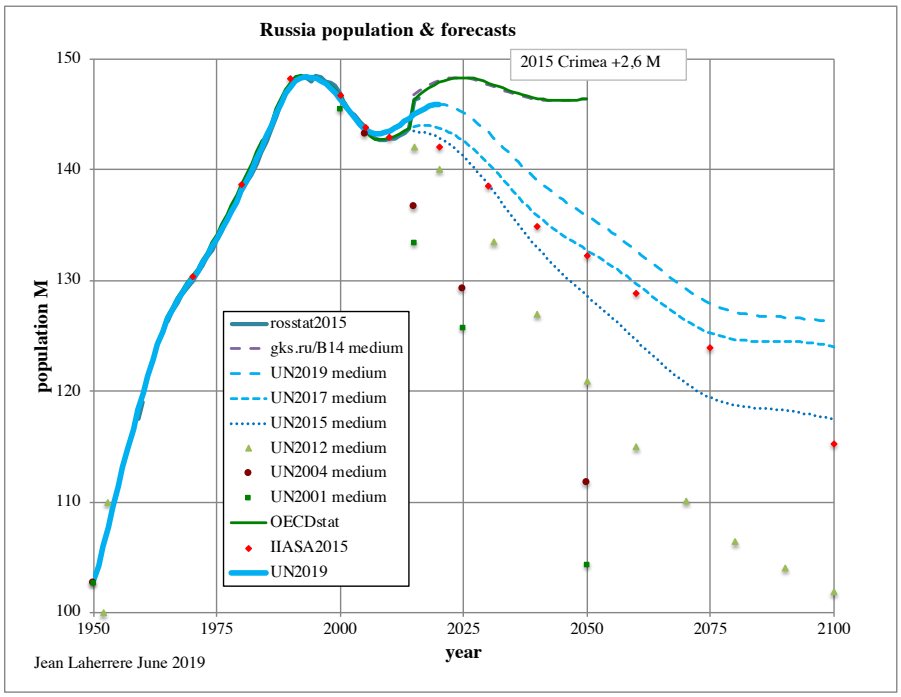
UN forecasts in 2003, 2012, 2015 and 2019 differ widely, giving for 2100 a range of 57-76 for Germany, 60-79 for France and 64-82 for UK.
UN2003 forecasts for 2300 are largely unrealistic with fertility below 2.1 (going towards extinction), except if large migrations from Africa.



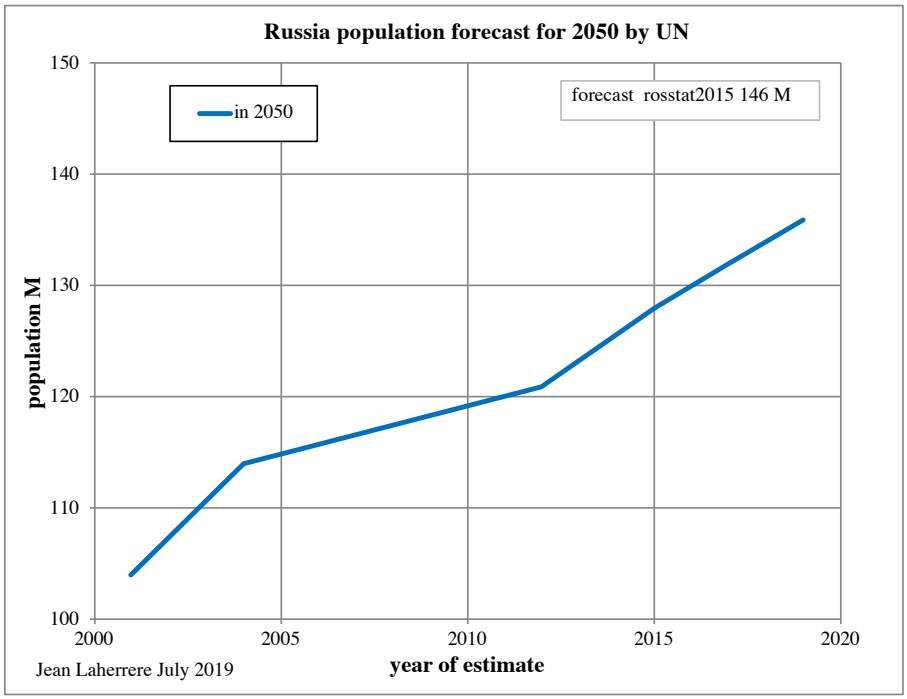
I do not understand why UN2019 forecasts a "population peak" before 2100 for France and Germany and not for UK.
UN2003 forecasts to 2300 look queer also: they are likely guessing to please some strange ideas.

-**Russia**

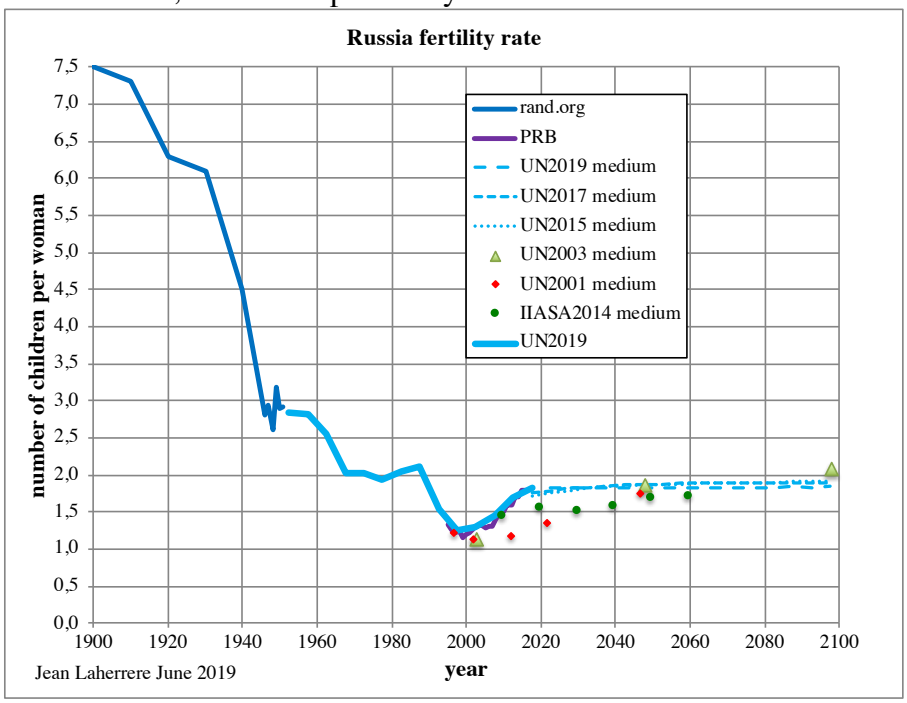
The increase in Russia population UN forecast for 2050 (medium fertility) was large, with 103 M in 2001 and 136 M in 2019. But the forecast by Rosstat is much more with 147 M including Crimea (excluded by UN). It is likely that Crimea will stay Russian



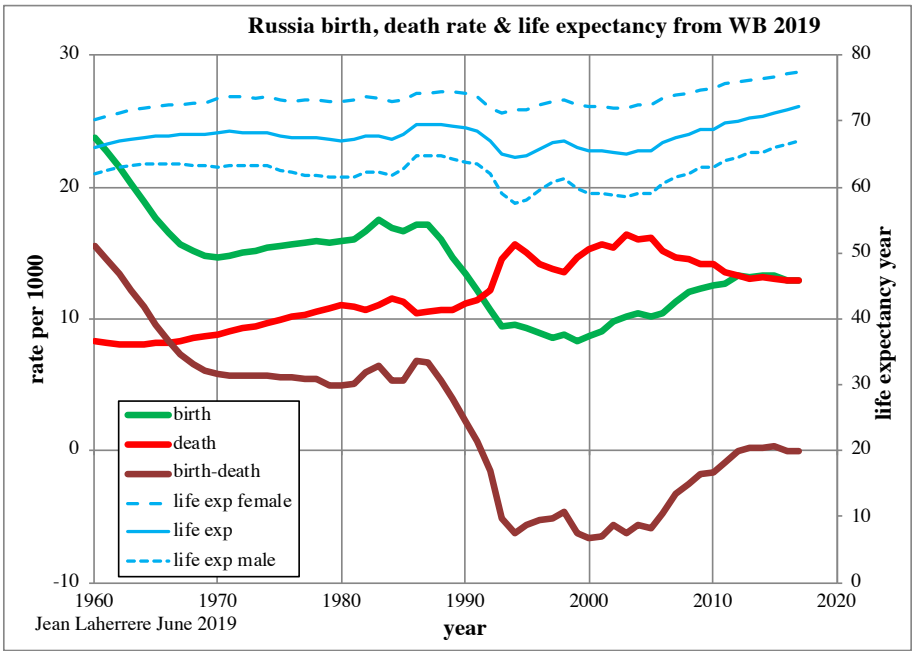
It is obvious that the UN were not very good in forecasting Russia population

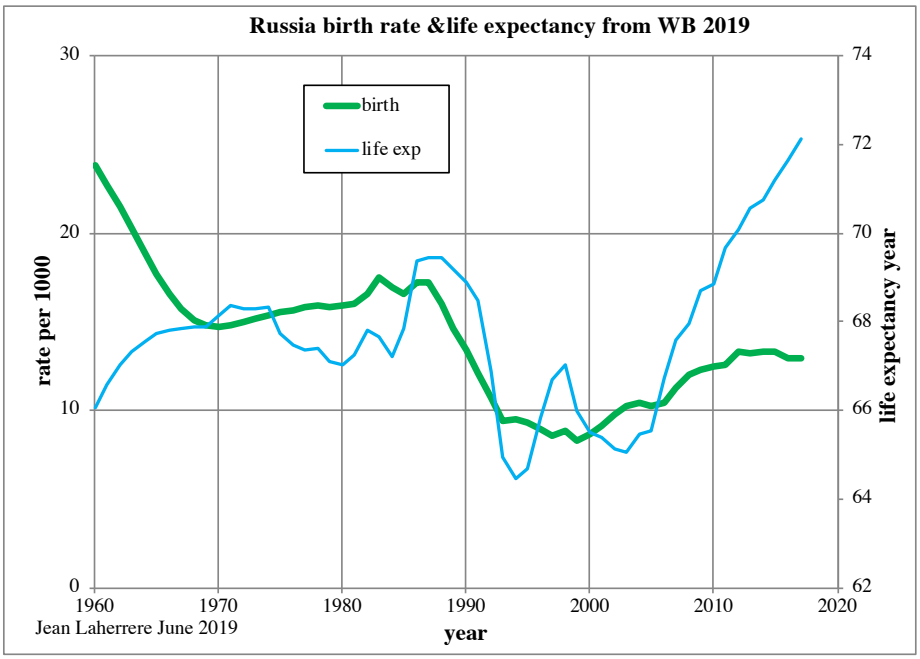


Russia fertility rate has dropped from 7.5 children per woman in 1900 to 1.16 in 1999, but happily has increased to 1.8 in 2016, but PRB reports only 1.6 in 2018.

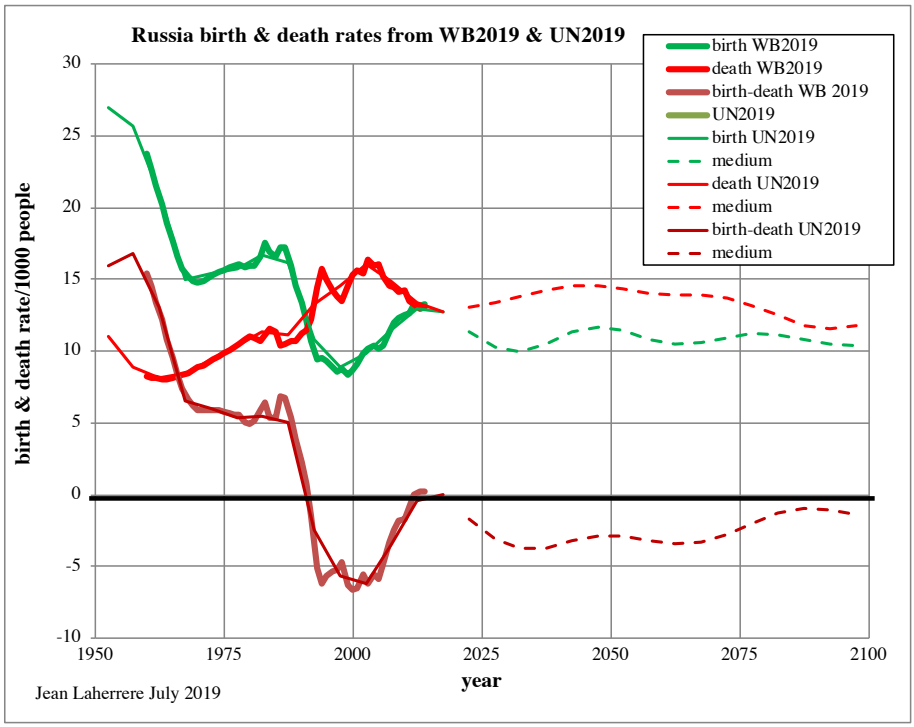


WB2019 reports birth rate increase from 1970 to 1986 and from 1999 to 2016. But the worst was death rate increase from 1962 to 2005. Things look better since 2005

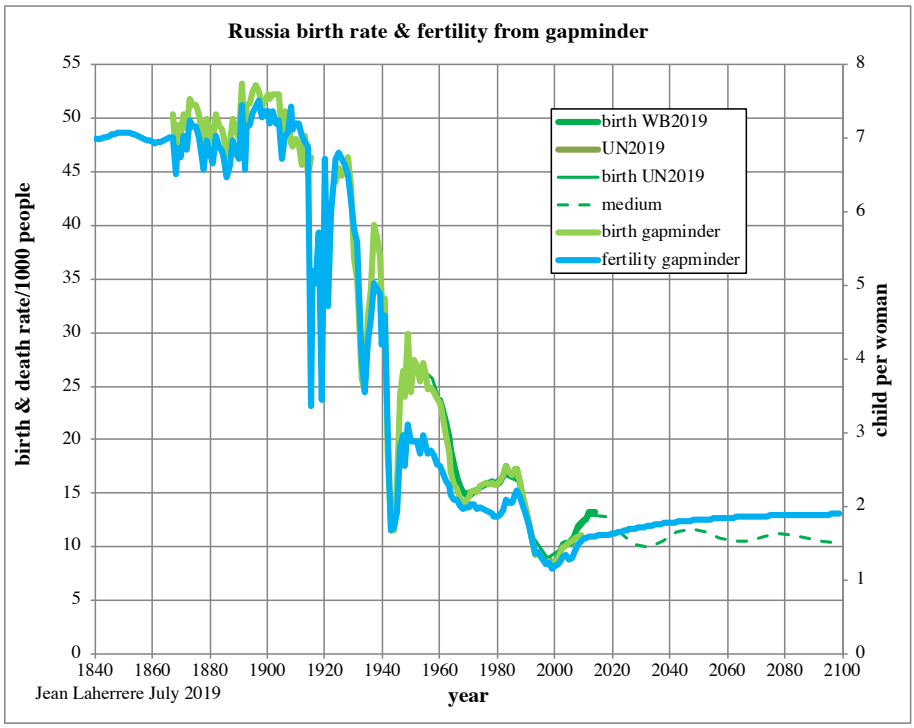




UN2019 forecasts for 2020-2100 almost flat birth and death, as in the past they were up and down.

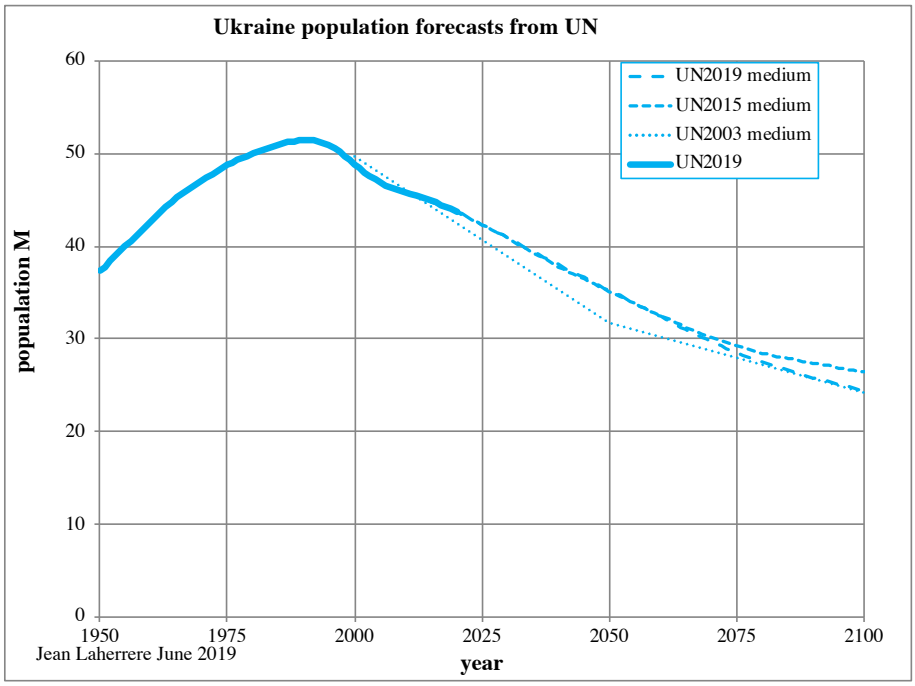


Russia birth rate went from 50 in 1900 to 10 in 2000, and increased after, but hard to forecast the future.

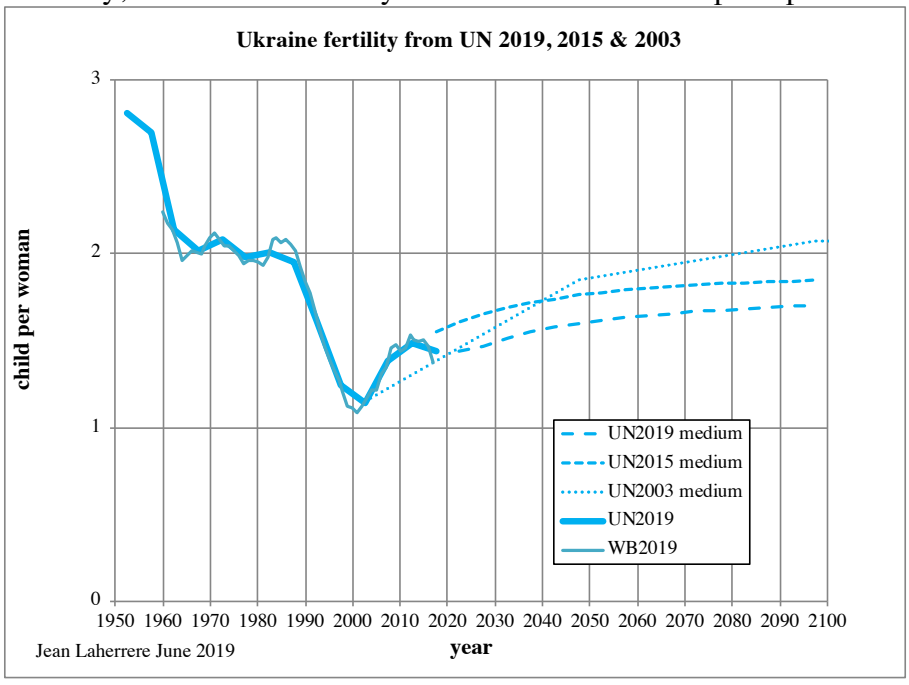


-**Ukraine**

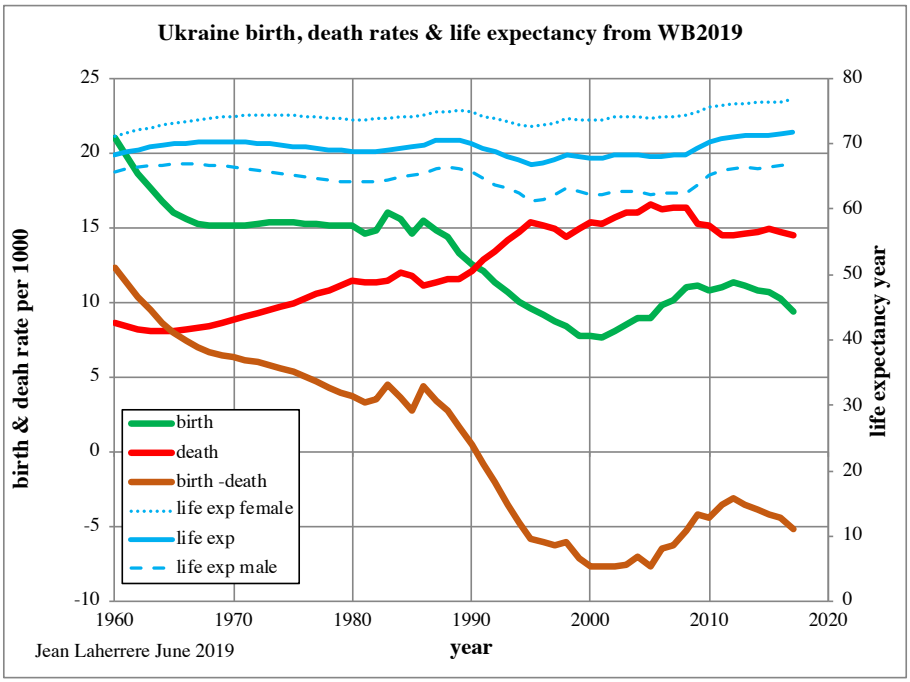
Ukraine is interesting by having reached population peak in 1990 at 51 M and UN2019 medium forecasts half population for 2100



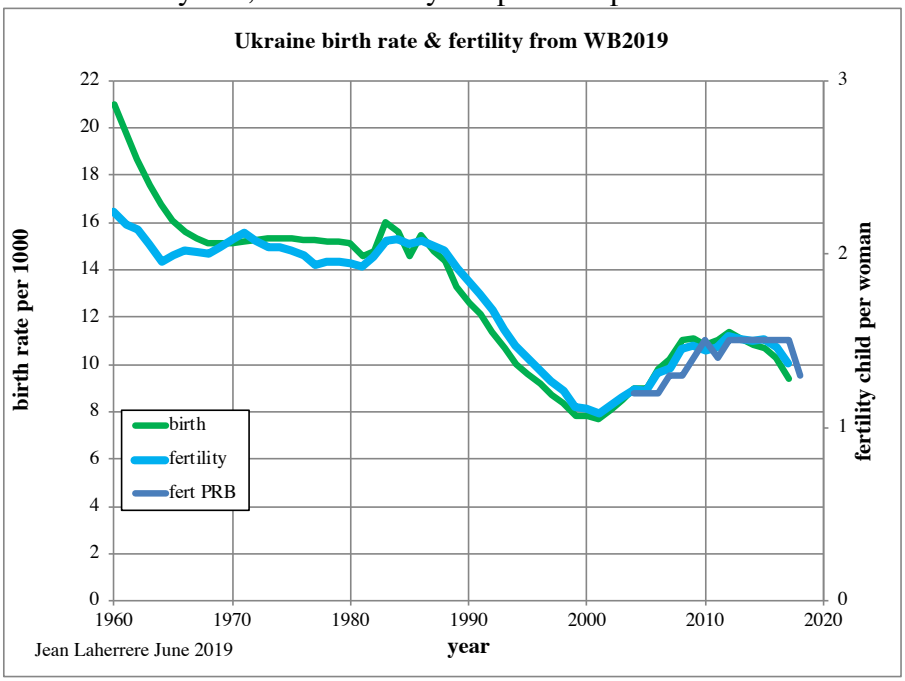
Ukraine fertility went down to 1.13 in 2001, up in 2012 and down again. The future of Ukraine is uncertain, as its fertility, but UN wants always to increase to reach utopic replacement value.



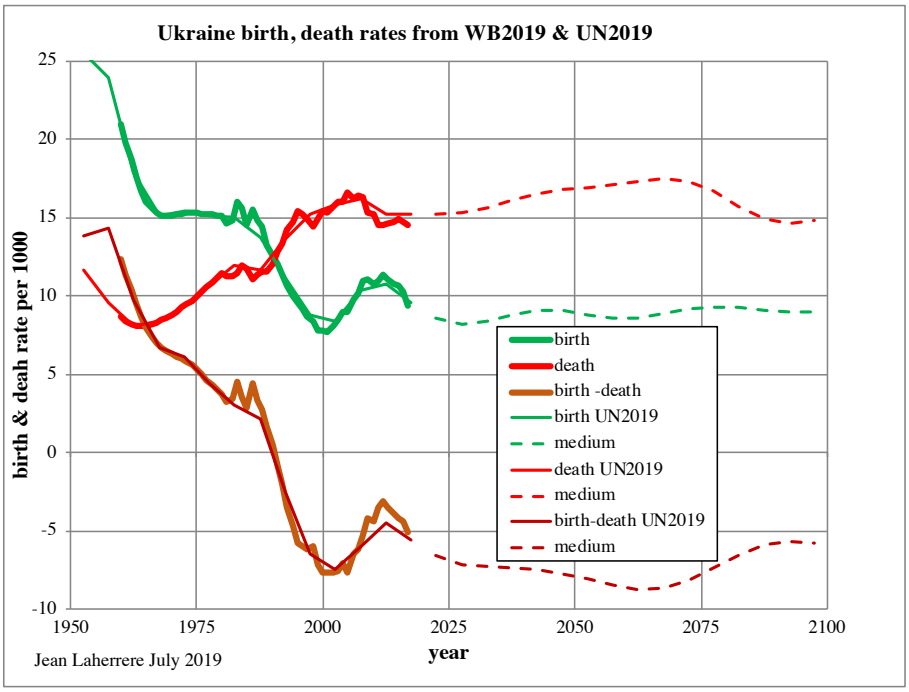
Death rate was up from 1965 to 2008 and down after.



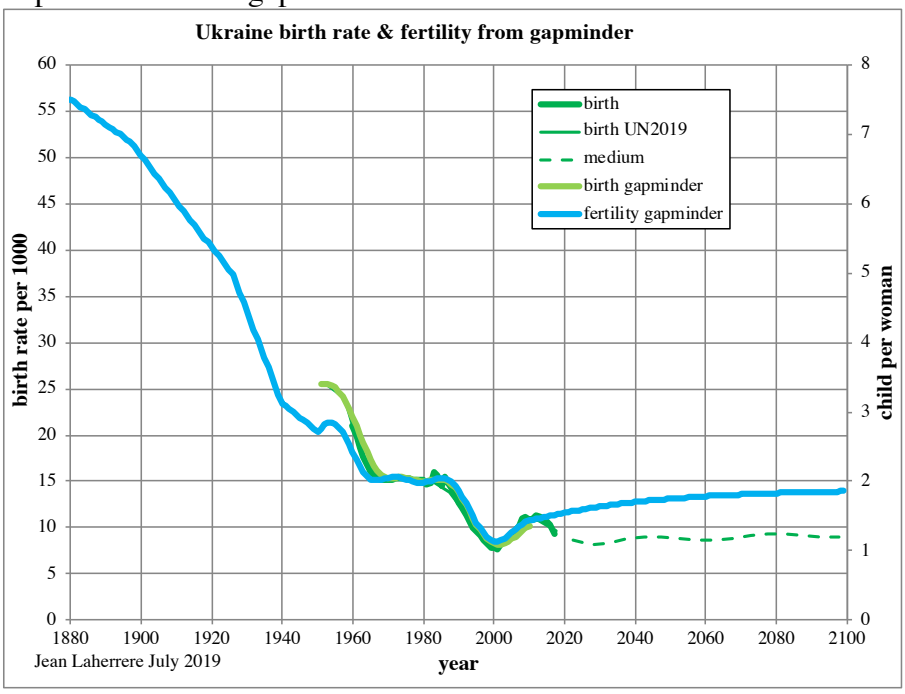
Fertility is down for the last years, constricted by the political problems



Hard to forecast future birth and death rates.

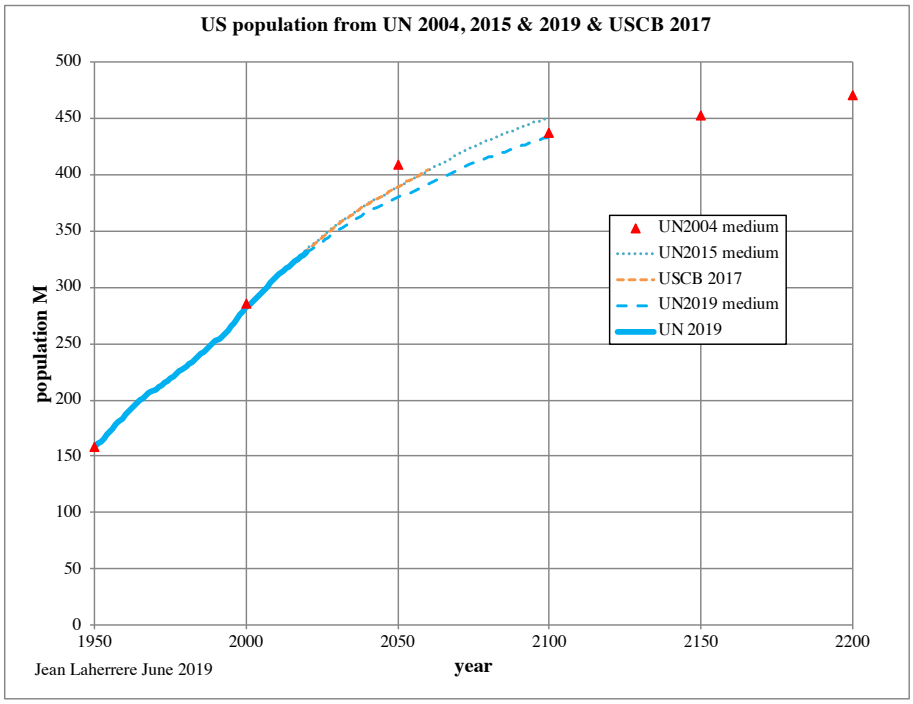


UN2019 is more pessimistic than gapminder

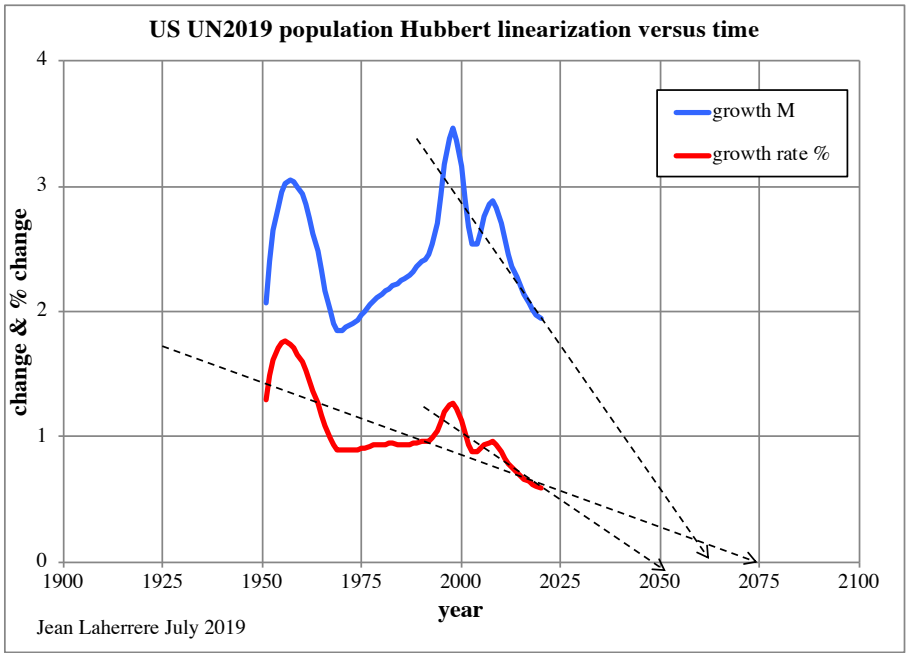


-**US**

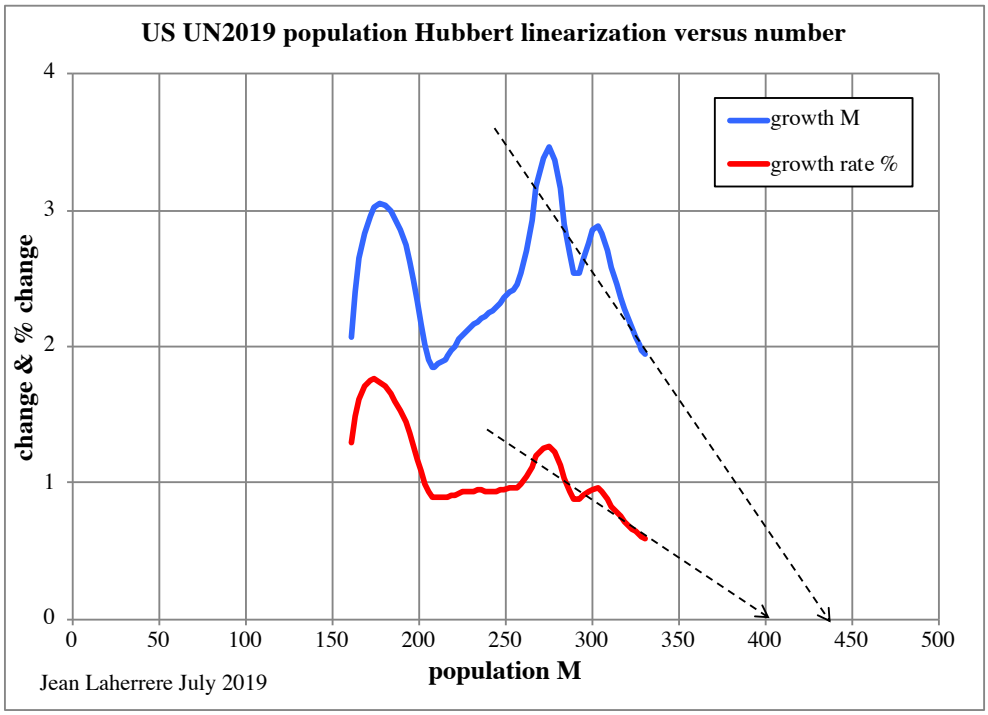
UN2019 forecasts US population in 2100 at 437 M (UN2015 was 447 M)



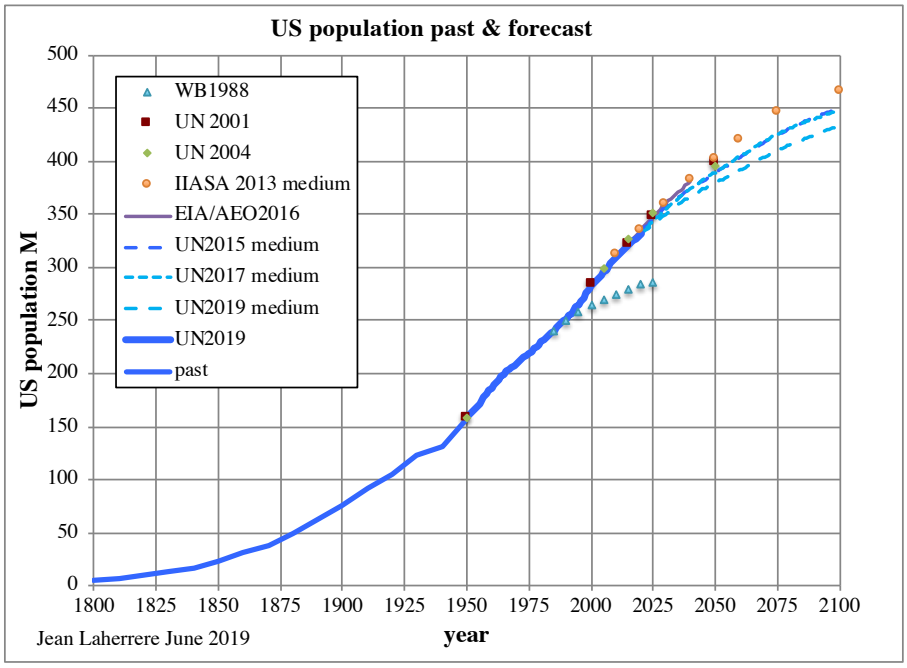
Hubbert linearization of UN2019 growth and growth rate versus time trends towards a peak between 2050 and 2075



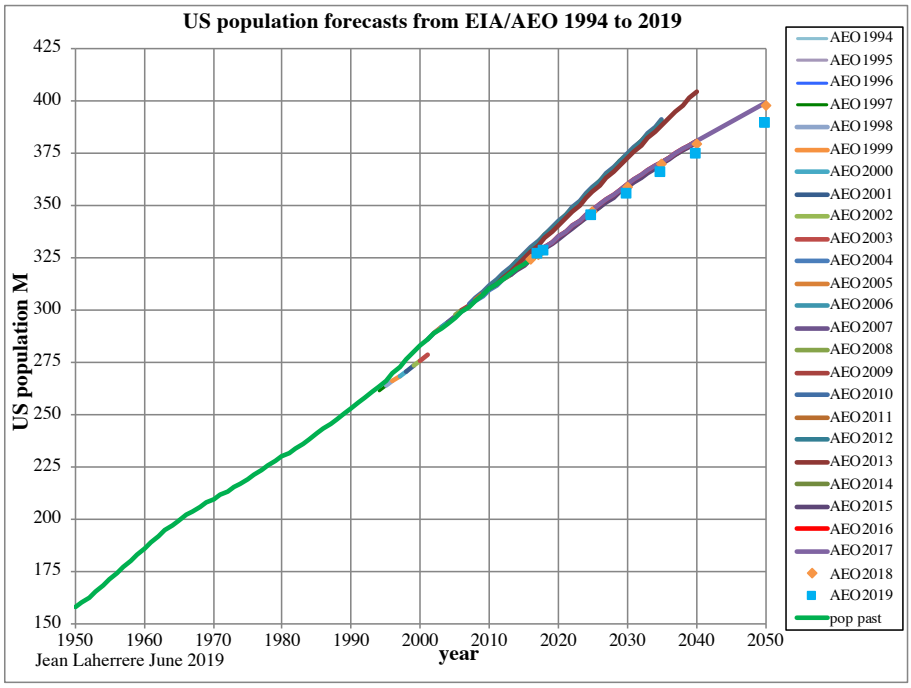
The same linearization versus number of population trends towards a peak between 400 and 440 M



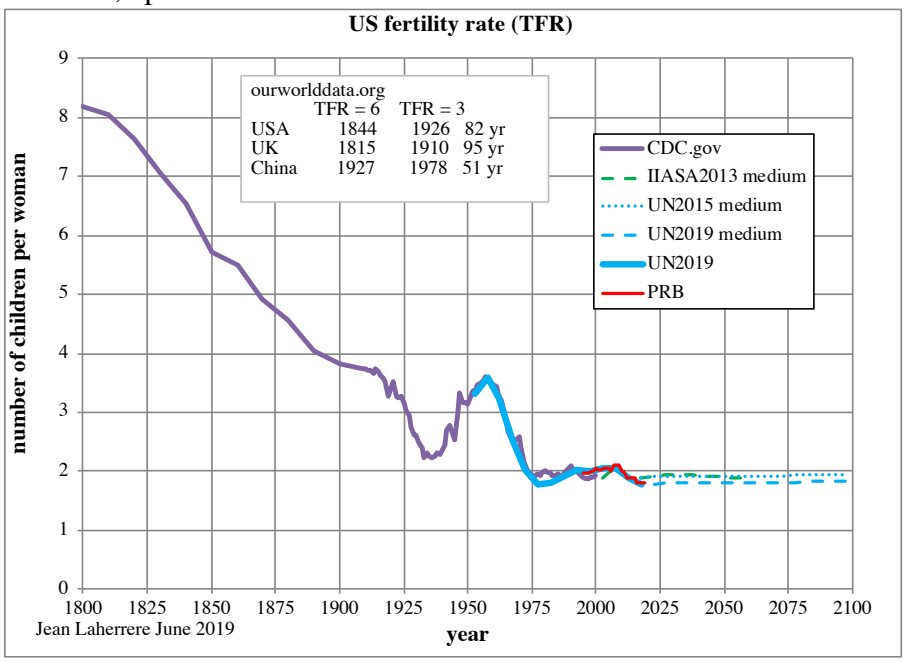
It is hard to forecast US population from past data.
IIASA medium forecast for 2100 was 460 M, not yet peaking!



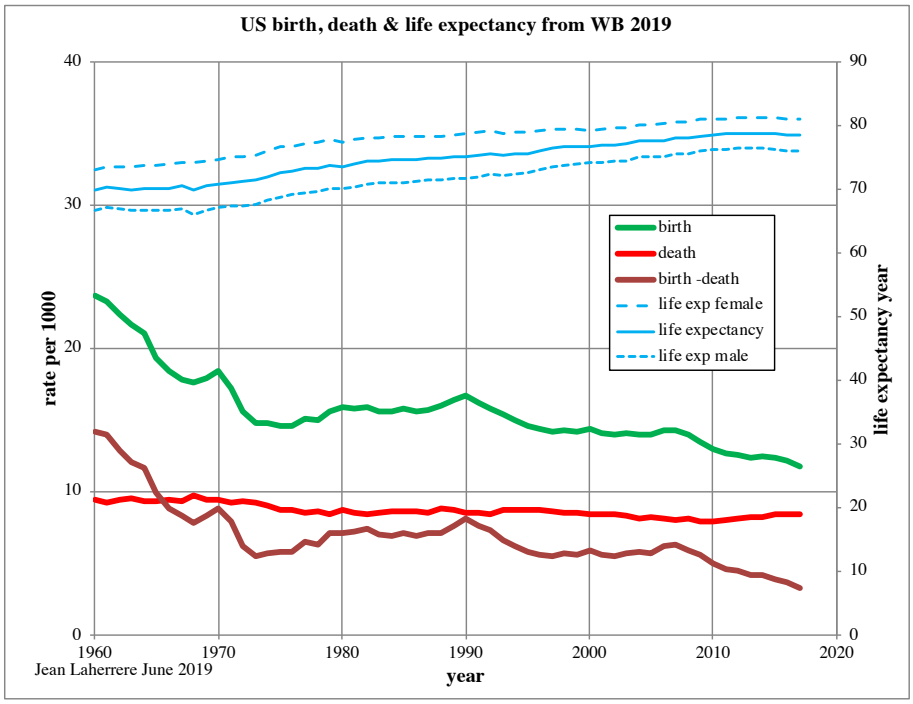
USDOE/EIA forecasts US population in their AEO and the evolution from AEO1994 to AEO2019 is rather for a decrease. The big unknown is immigration.



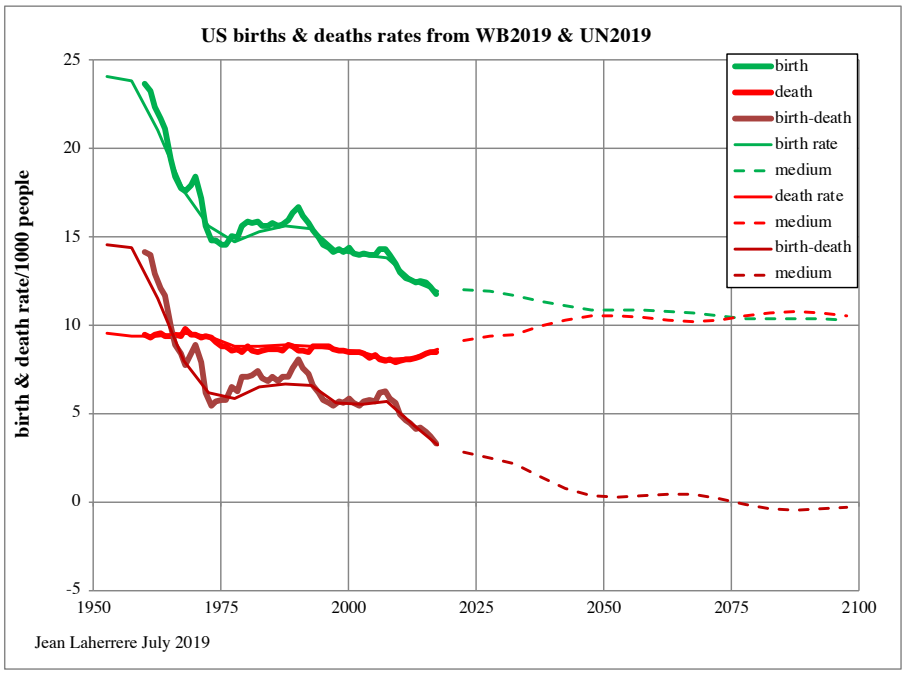
US fertility was over 8 children per woman in 1800 (compared with less than 5 in France) and dropped to 2.1 on 1930, up to 3.7 in 1960 and down to 1.8 in 2017.



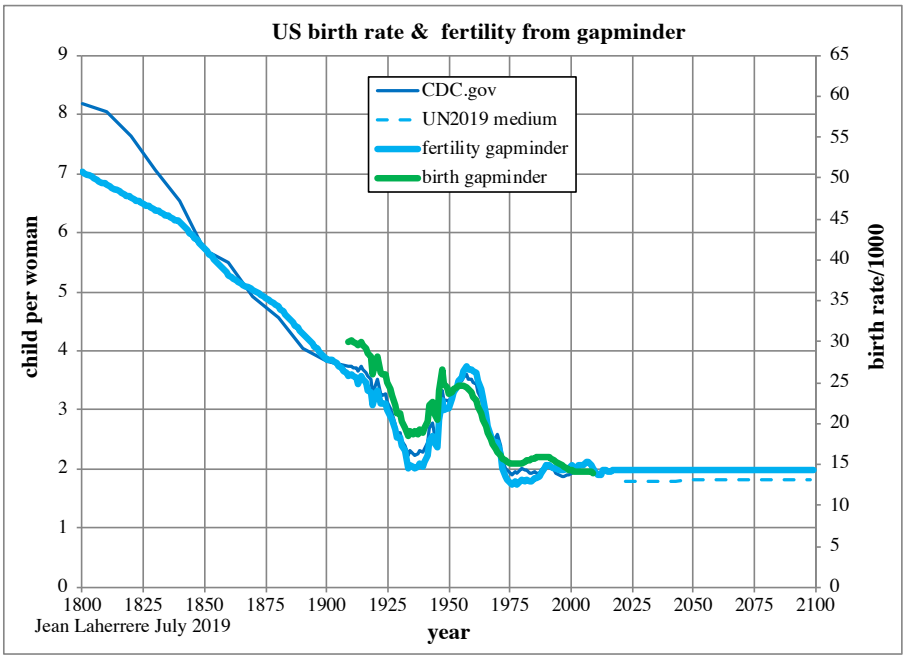
From WB2019 birth rate is decreasing since 1990 and death rate is flat since 1980



UN2019 forecasts from 2050 to 2100 similar birth and death rate: on what criteria?



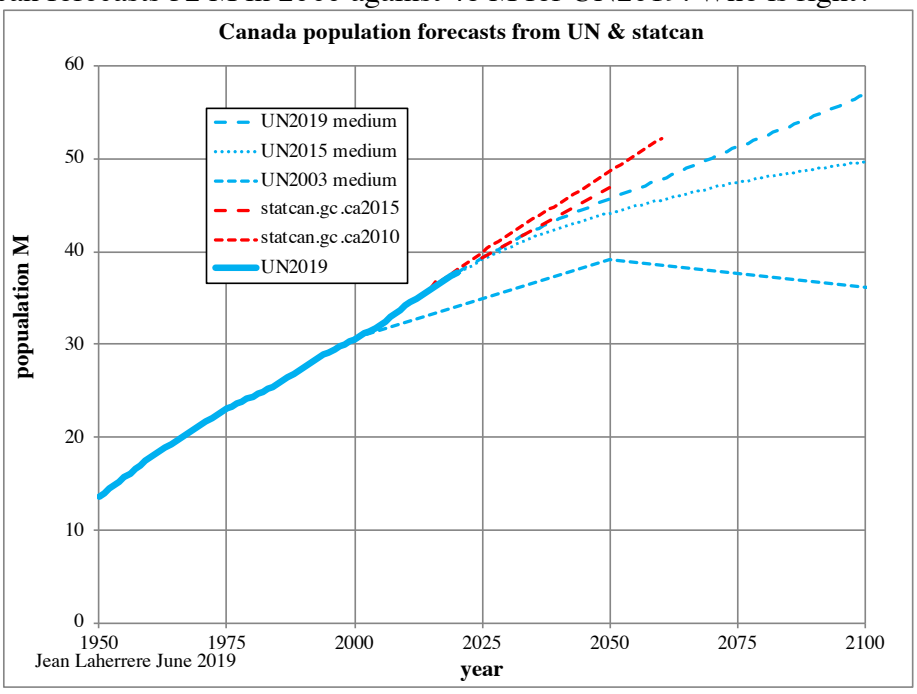
UN2019 medium fertility is assumed to be flat from now to 2100: again, no real reason.
PRB data 2008 = 2.1, 2011 = 2.0, 2014 = 1.9, 2018 = 1.8



UN2019 forecasts look unreliable!

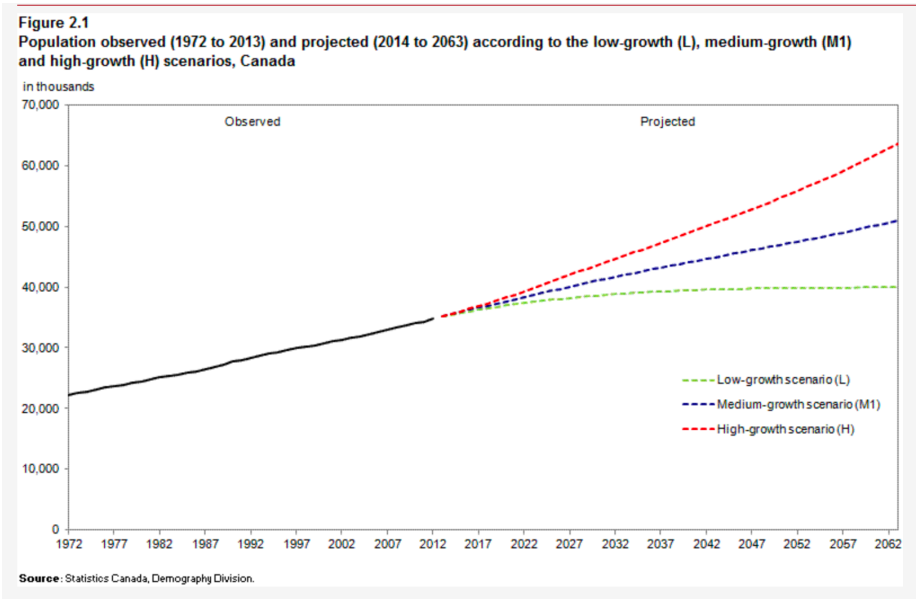
-Canada

UN2019 medium forecasts Canada population at 57 M in 2100, when UN2003 did it at 36 M, quite a change! Statcan forecasts 52 M in 2060 against 48 M for UN2019. Who is right?



Statcan last (2015) displays a large range

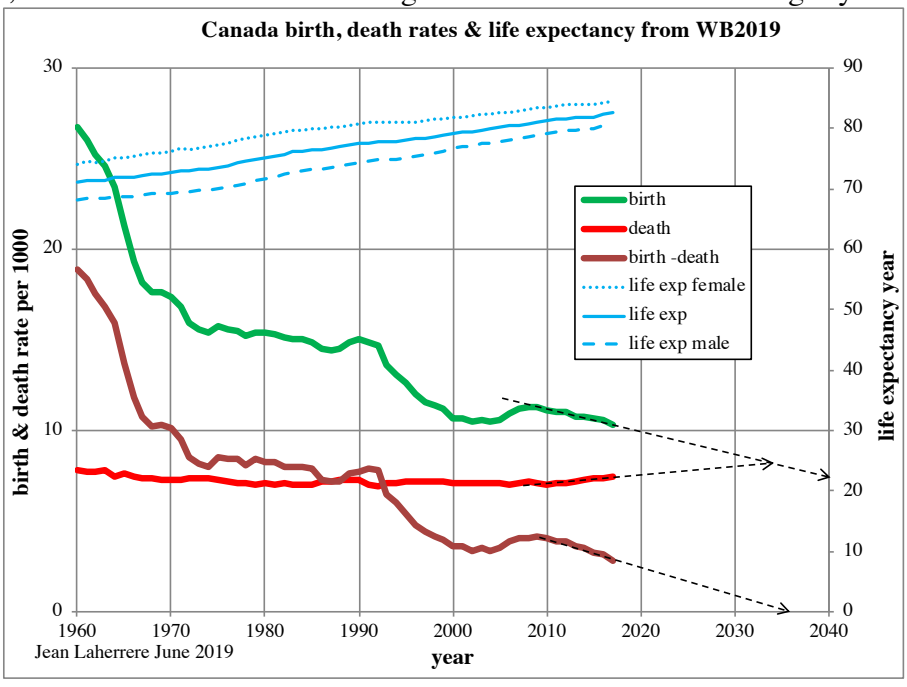
https://www150.statcan.gc.ca/n1/pub/91-520-x/2014001/c-g/c-g2.1-eng.htm



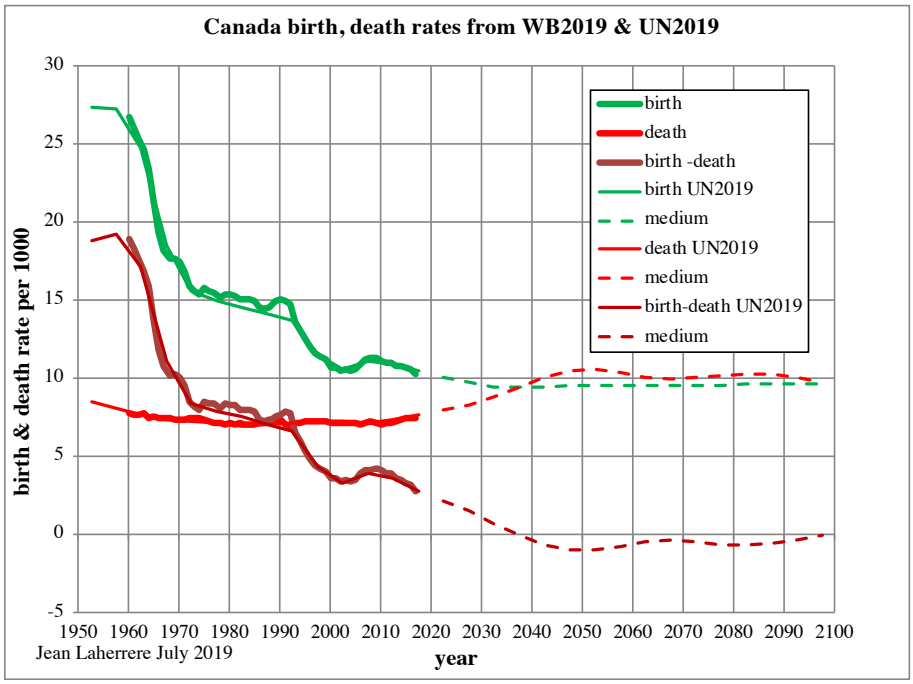
Data accuracy

The accuracy of any projection is conditional on the reliability of the base population estimates, the component data, and the degree to which the underlying assumptions correspond to future trends. Projections are not predictions; they are instead an effort to create plausible scenarios based on assumptions regarding the components of population growth, which are themselves subject to uncertainty. In this context, the accuracy of the data relies mostly on the calculation correctness and the credibility of the selected assumptions.

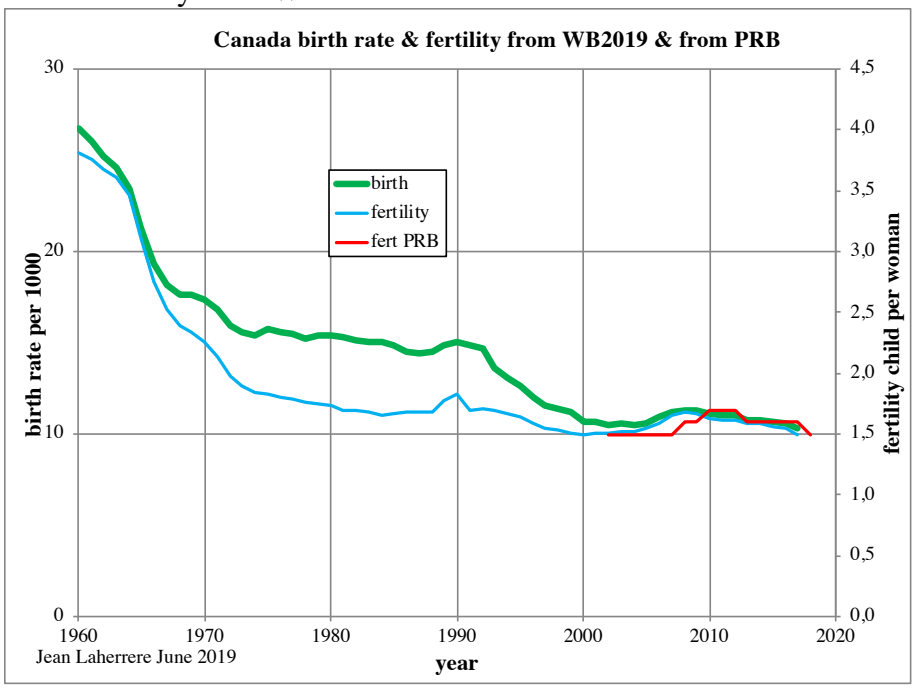
From WB2019, Canada birth rate is decreasing since 2008 and death rate slightly rising since 2010.



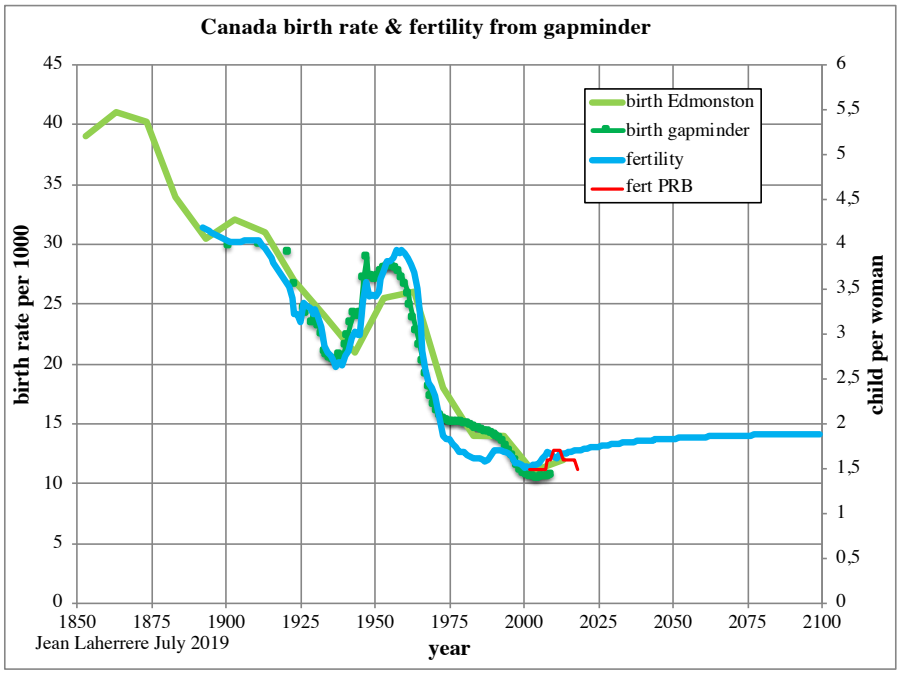
UN2019 medium forecasts that from 2040 to 2100 birth and death rates will be about 10: based on fact or utopia?



Canada birth rate and fertility from WB2019: 1960-2017

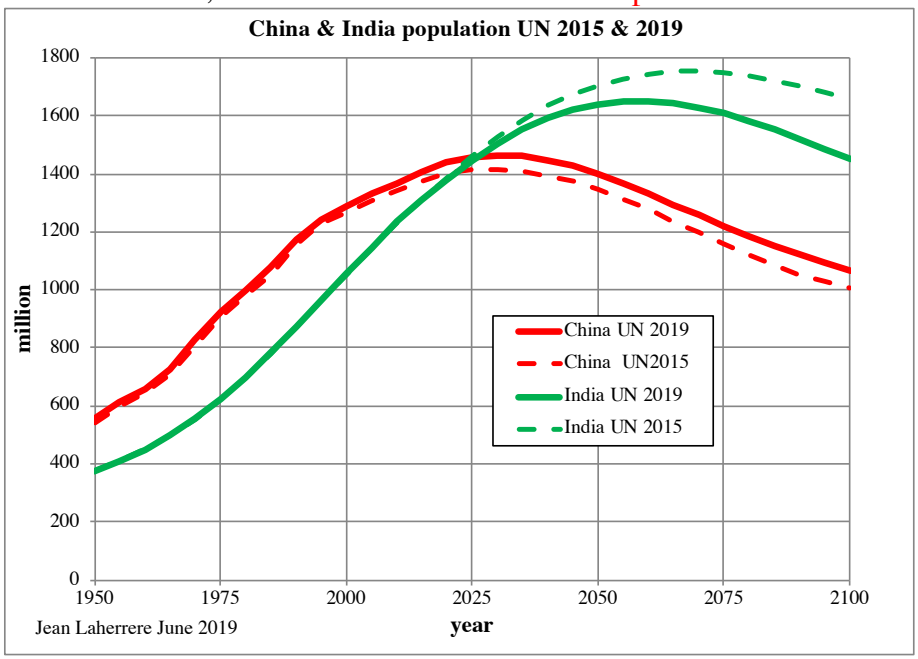


Canada birth rate and fertility from gapminder: 1850-2100: too optimistic for fertility beyond 2018 compared to PRB



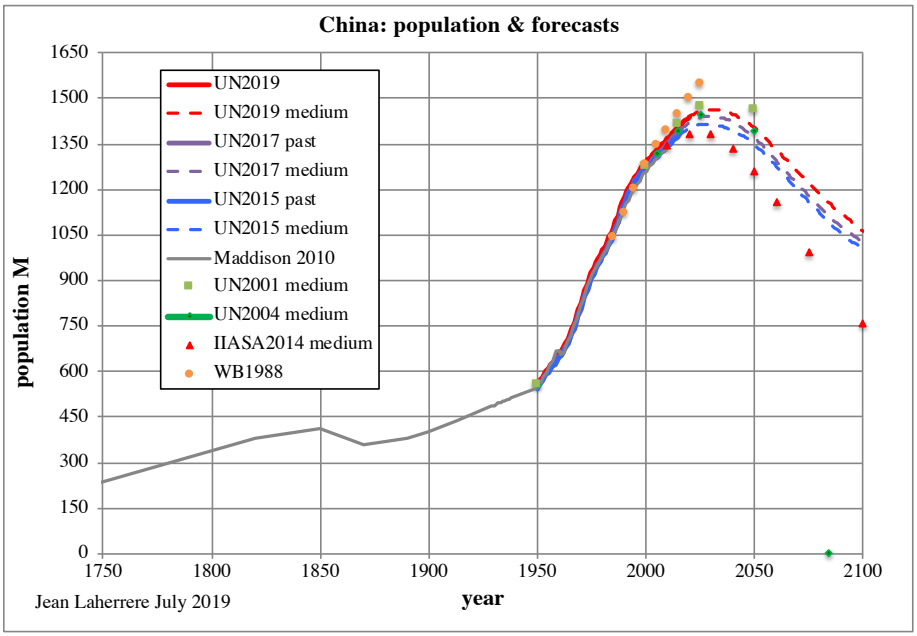
-China and India

The comparison of forecast for China and India from UN2015 and UN2019 displays an increase for India and a decrease for China; but both indicate that India will pass China around 2025

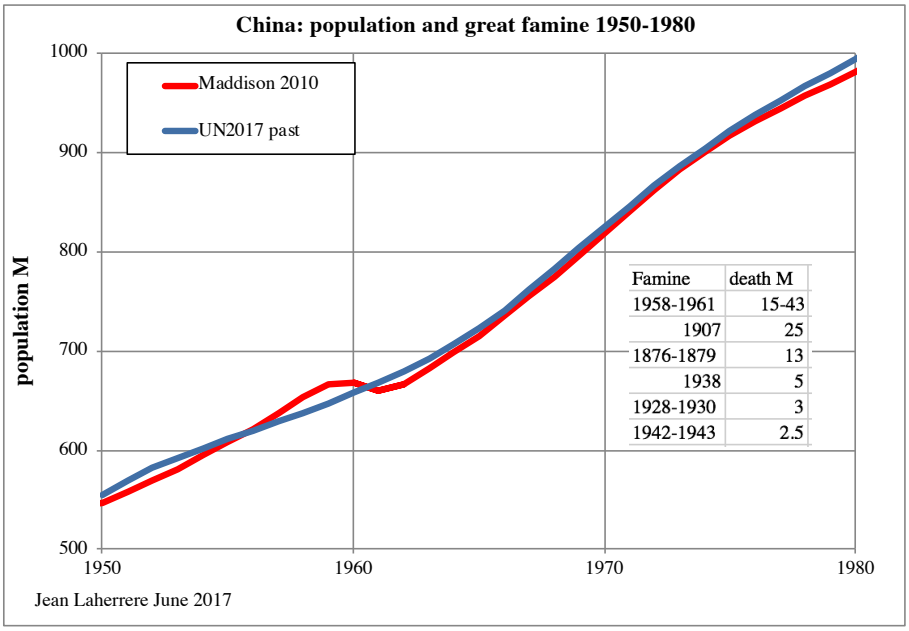


-China

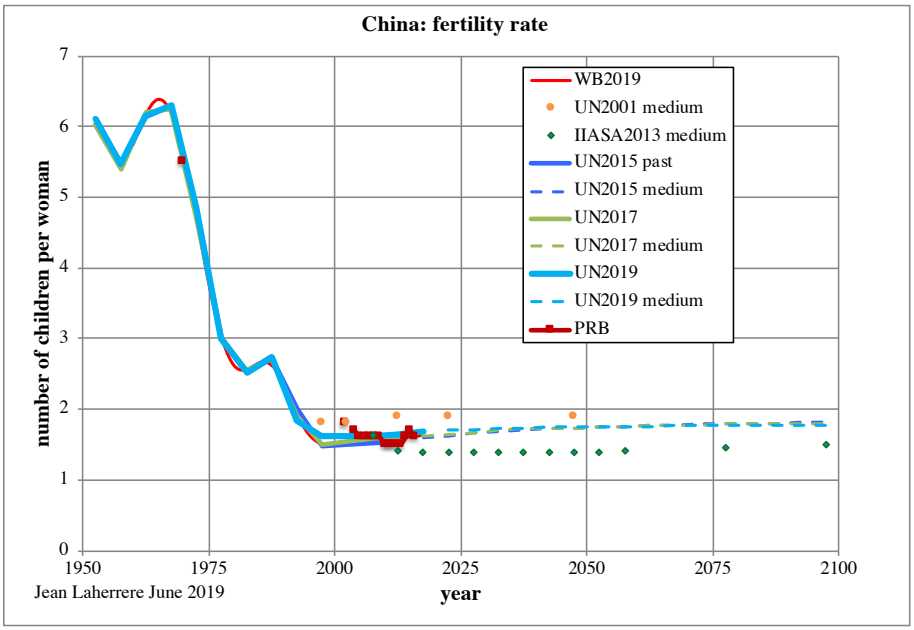
China population forecast has varied with time



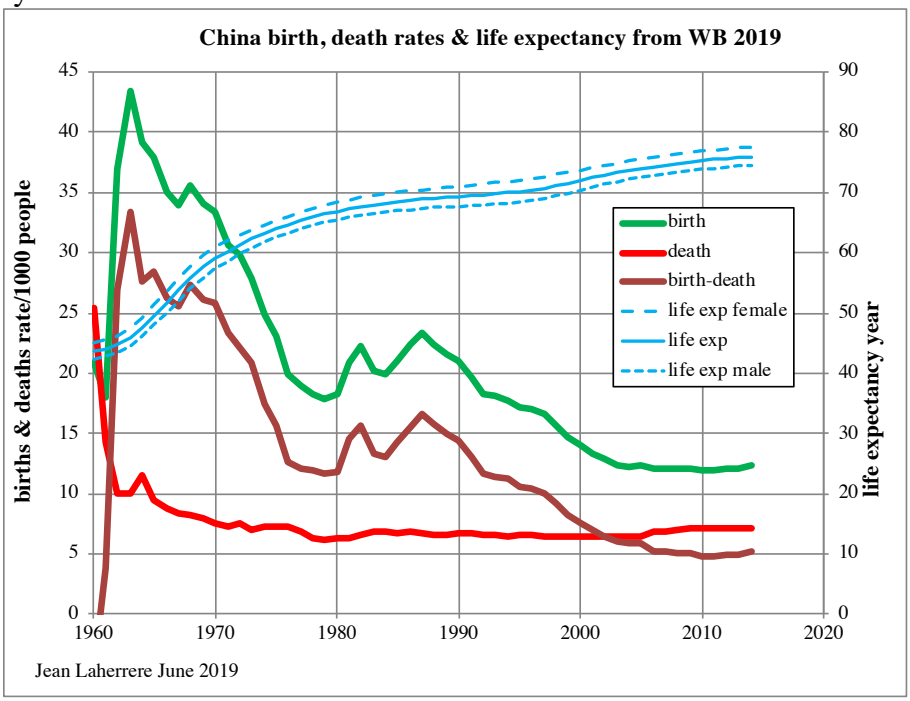
But past population is poorly reported by the UN, omitting the great famine 1958-1961, compared to data from Maddison. The UN hide facts to please their members!



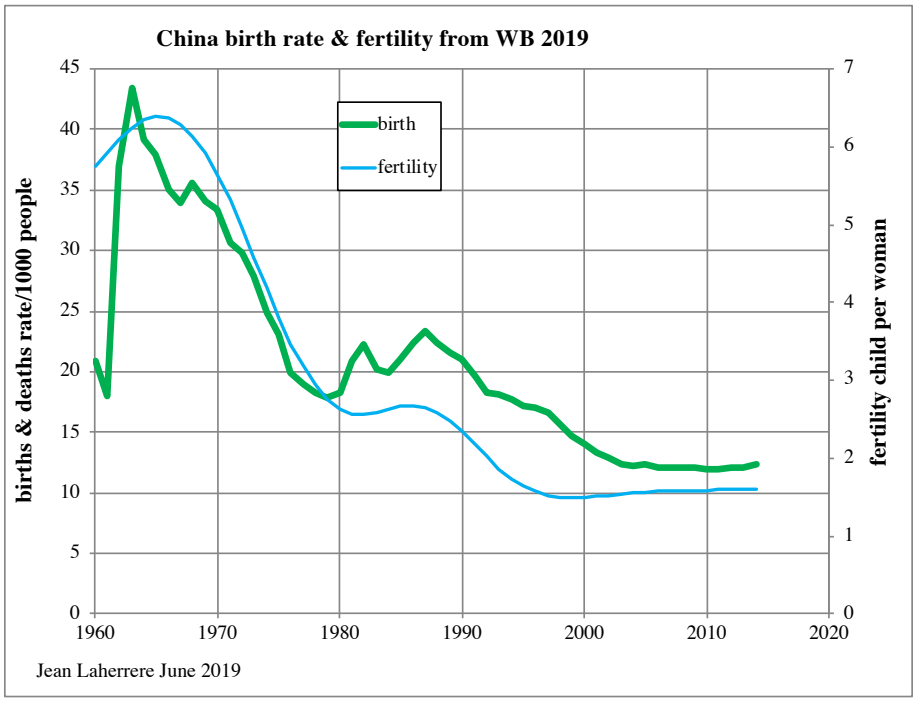
China fertility rate has dropped sharply with a low of 1.5 child per woman in 2012 and up to 1.8 (PRB) in 2018



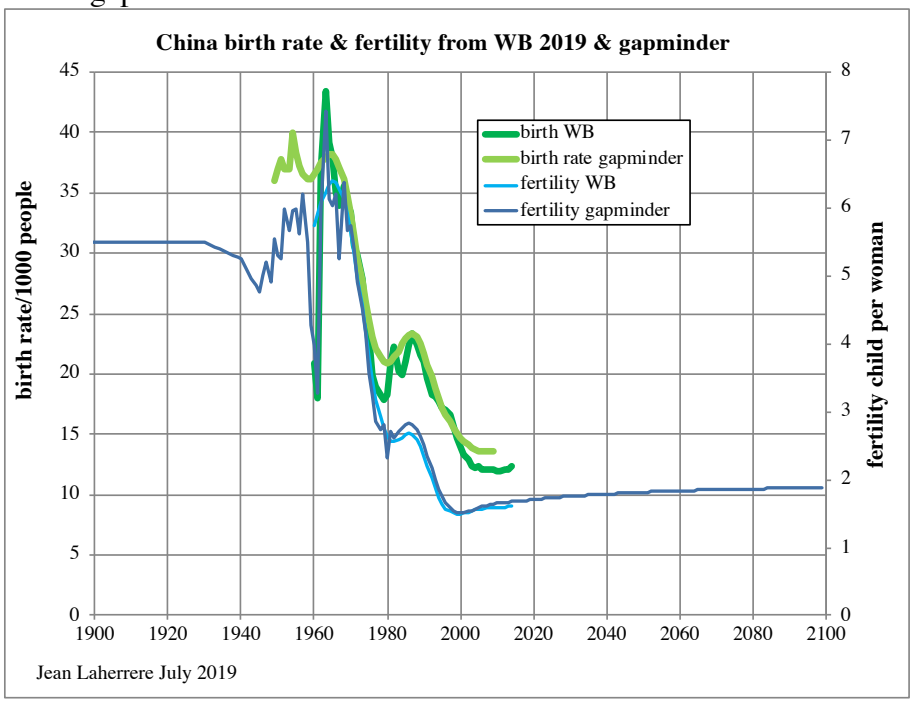
WB2019 displays a flat birth rate since 2003 and an almost flat death rate since 1970.



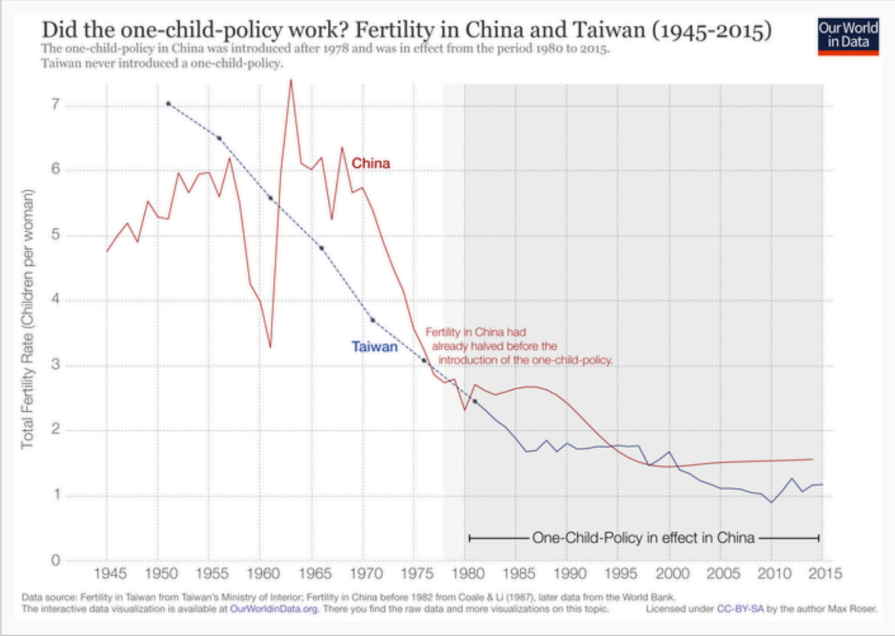
China fertility and birth rate from WB2019 vary together, but no strict relationship.



Same with data from gapminder

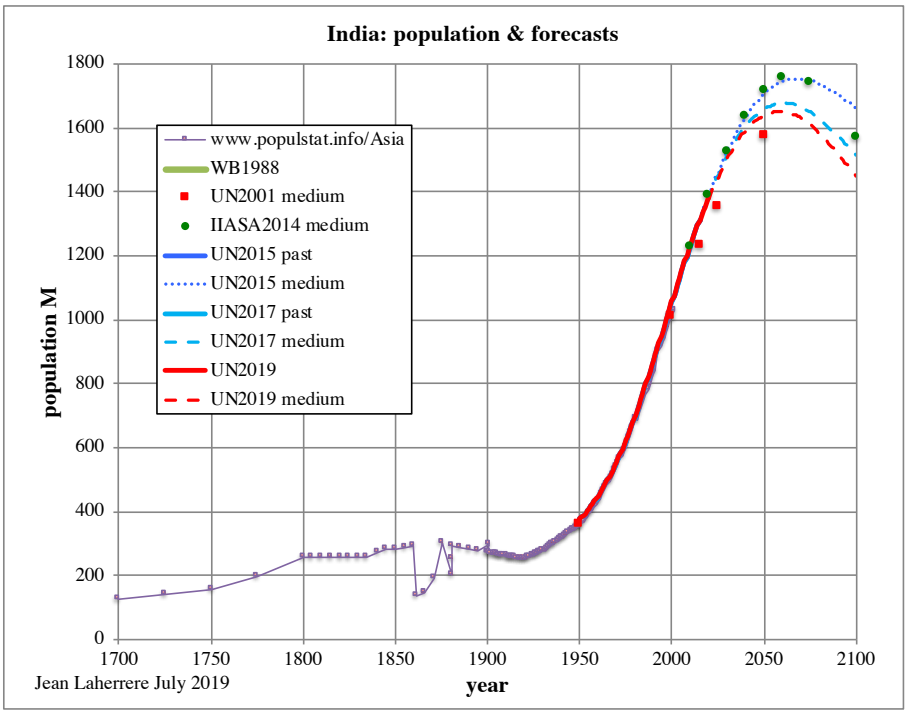


Our world in data questions the one-child policy in China compared with Taiwan

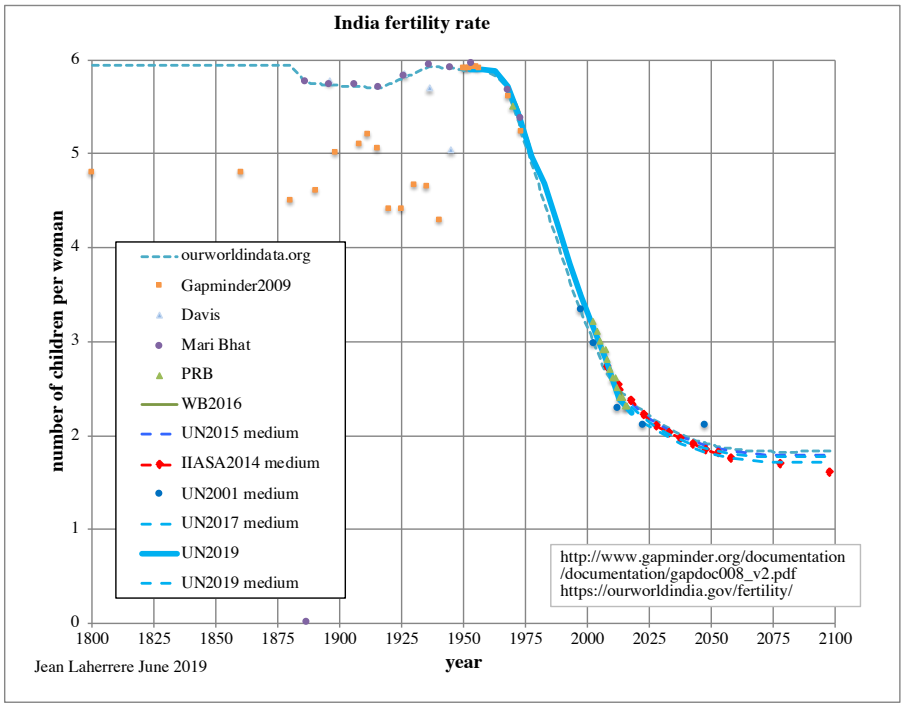


-India

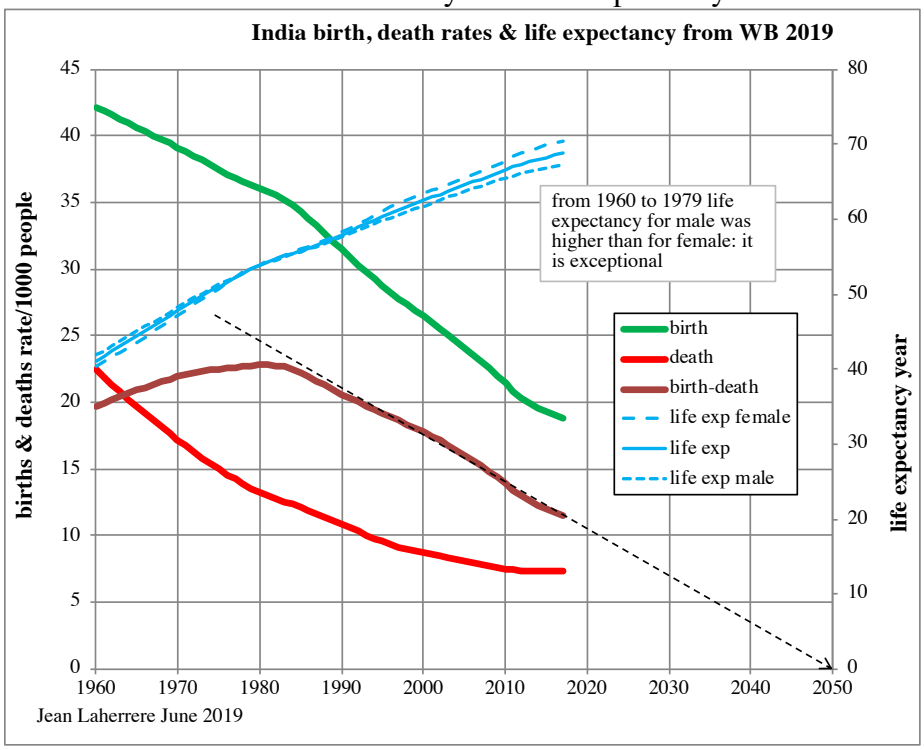
India population forecast is on decline.



India fertility rate has dropped sharply from 1965 to 2015

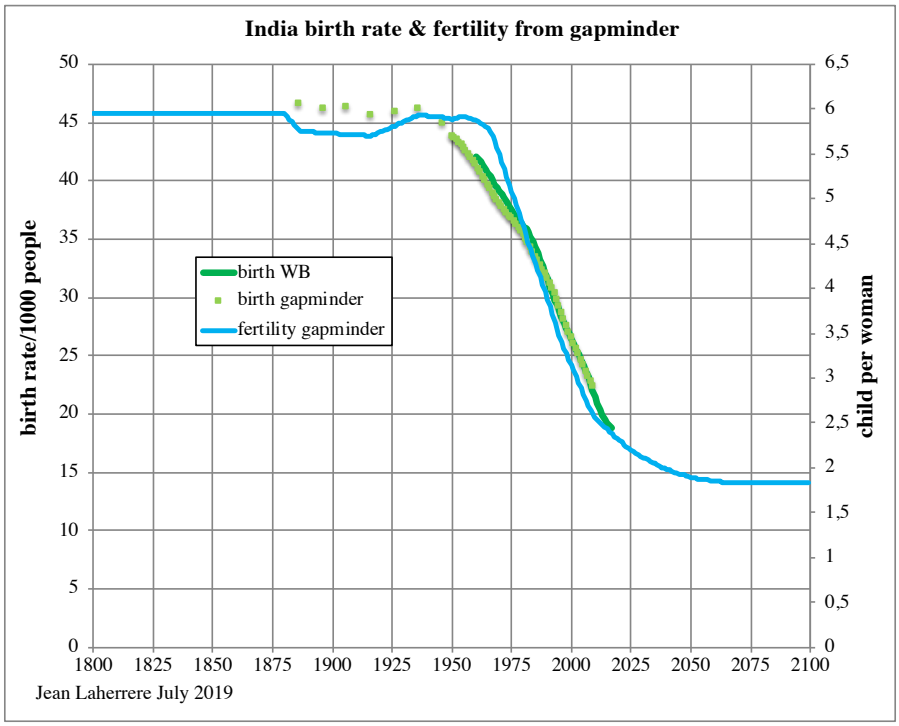


India birth and death rates look normal in contrary with life expectancy



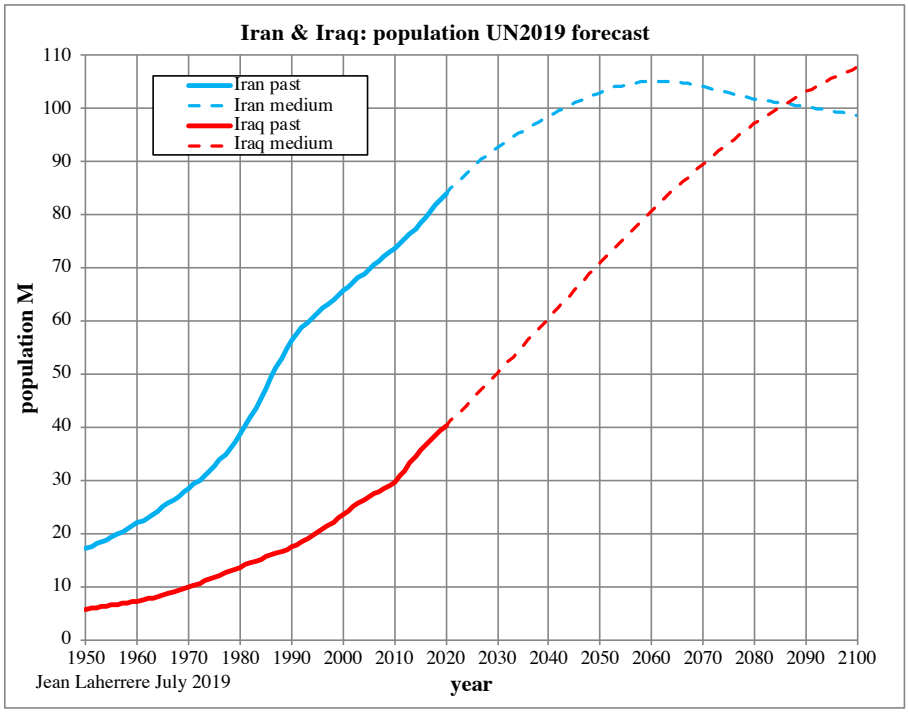
From 1960 to 1979 the life expectancy for male was higher than for female, it is exceptional (only 3 countries) and since 1980 India is back to normal: females live longer than males
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6345642/
Female life expectancy was lower than that of men in 3 countries (i.e., India, Iran, and Iraq) in 1960.
It is hard to find any particular reason to explain such anomaly only in these three countries (except beginning by I) and why stopping in 1980?

India birth rate and fertility are similar.

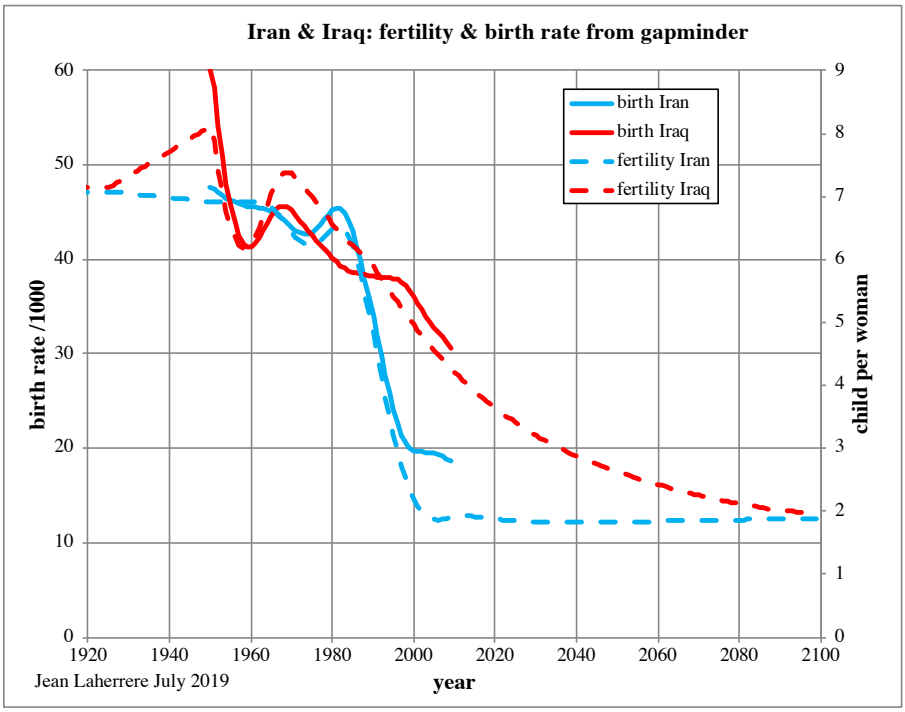


-**Iran & Iraq**

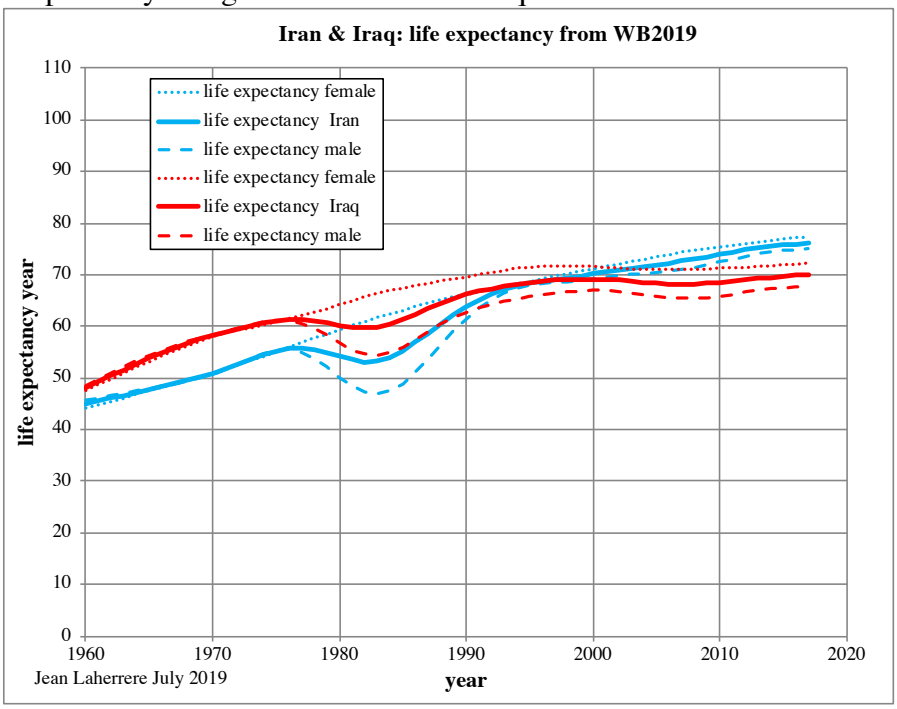
In 2019 Iran population is 83 M against 39 M for Iraq, but UN2019 forecasts that Iraq will overpass Iran in 2085.



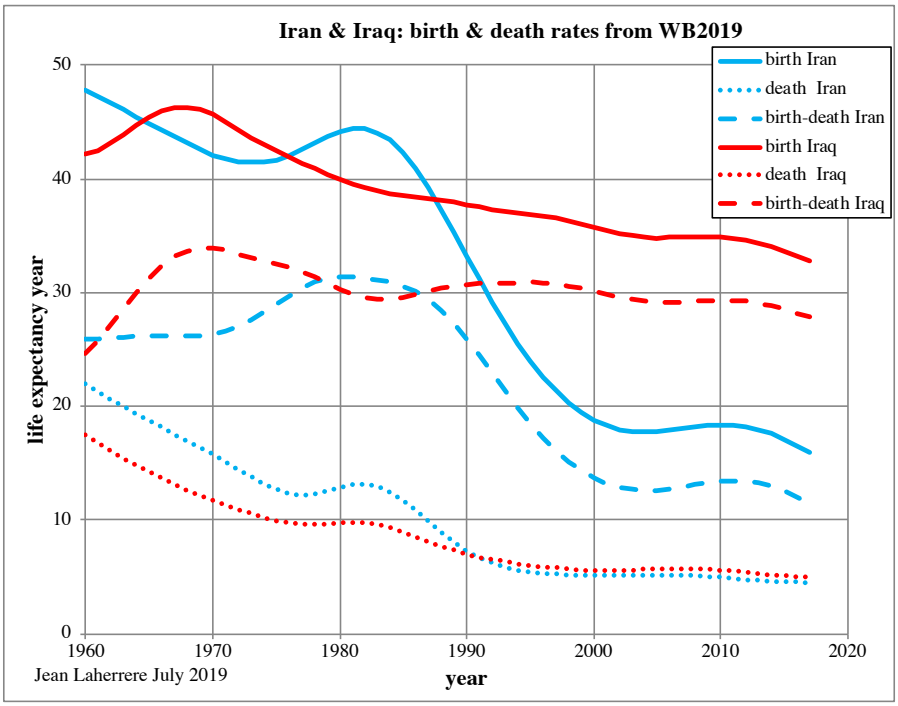
Iran fertility (and birth) has dropped after 1985 sharply compared with Iraq



Iran female life expectancy was equal to male life expectancy from 1960 to 1977, same in Iraq and moving in parallel. A low corresponds to the war between the two countries from 1980 to 1988 Since 2000 life expectancy is higher in Iran than in Iraq.

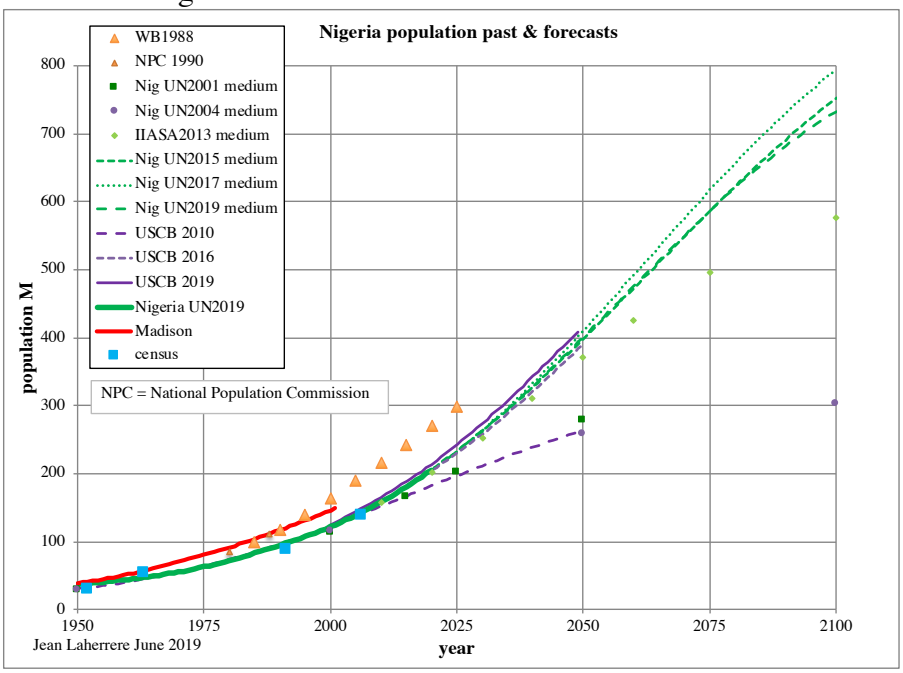


Birth rate decreases more in Iran than in Iraq since 1987, but death rate is equal since 1990.

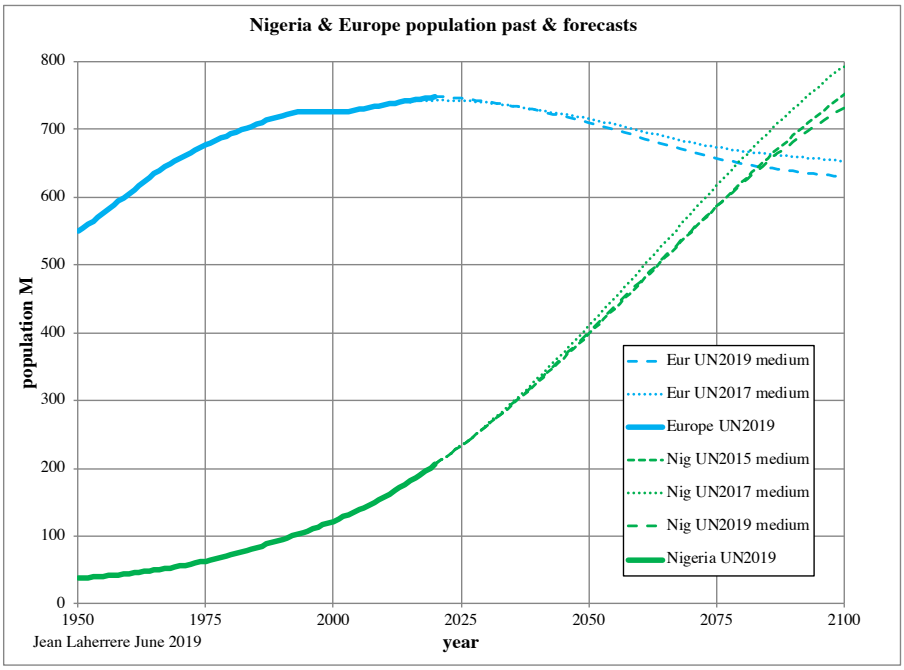


-**Nigeria**

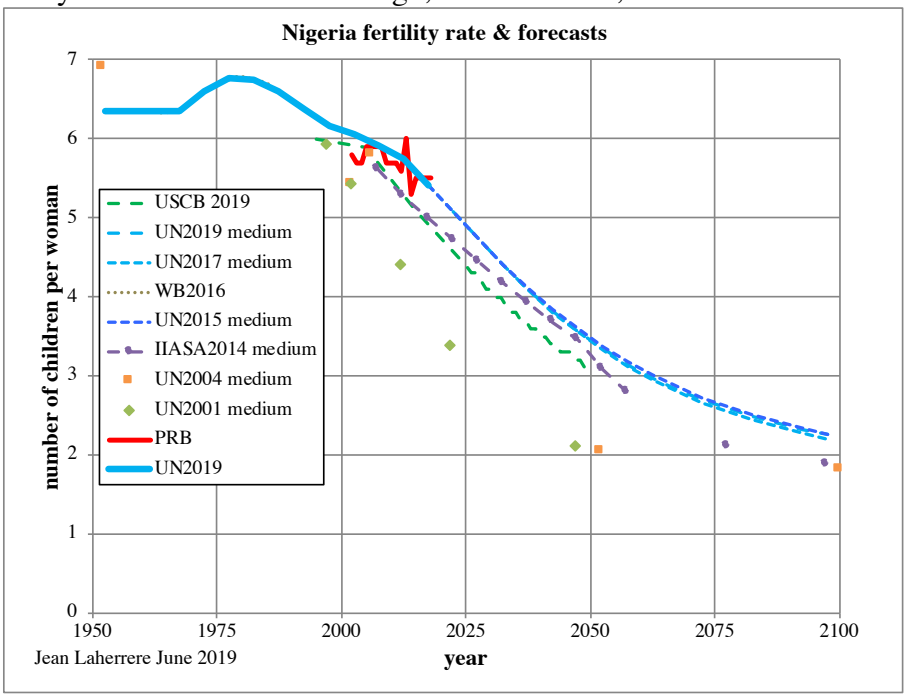
In 1990 the UN reported Nigeria with 120 M (States were fighting together, each claiming high population) and the following census showed that this value was overestimated by 30%.
WB1988 forecast was too high.



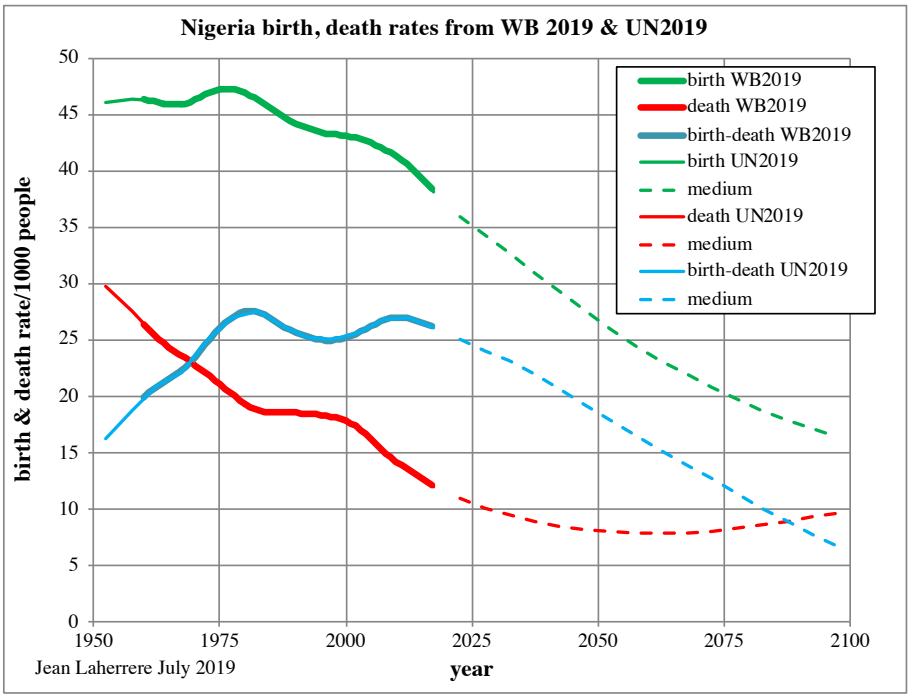
UN2019 forecasts 733 M in 2100 for Nigeria against 630 M for Europe!
Nigerians will flood Europe!



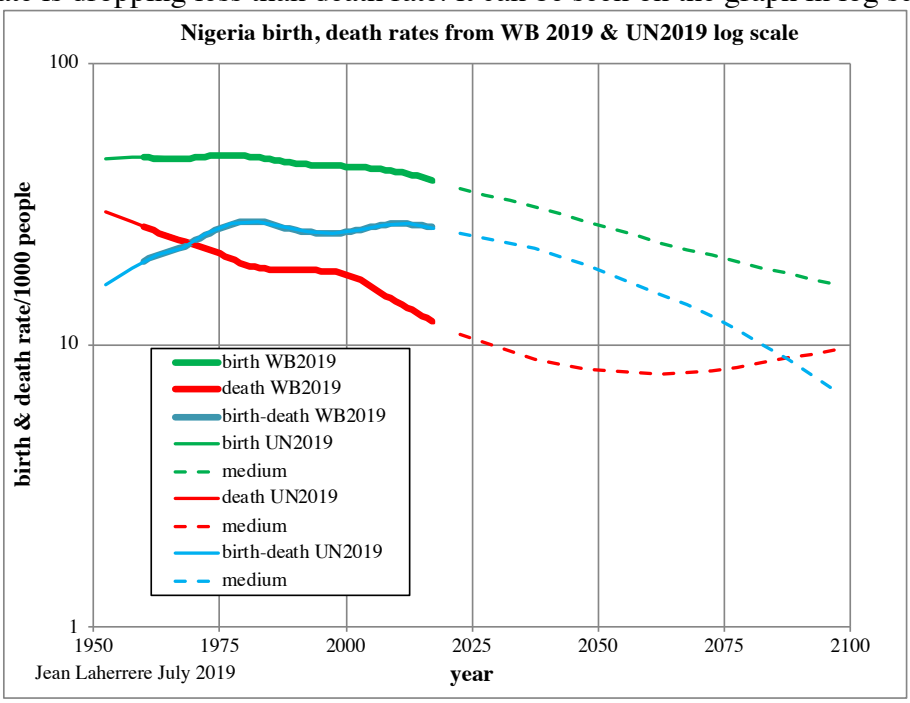
USCB 2019 fertility forecast looks out of range, much too low, as was UN2001 medium.



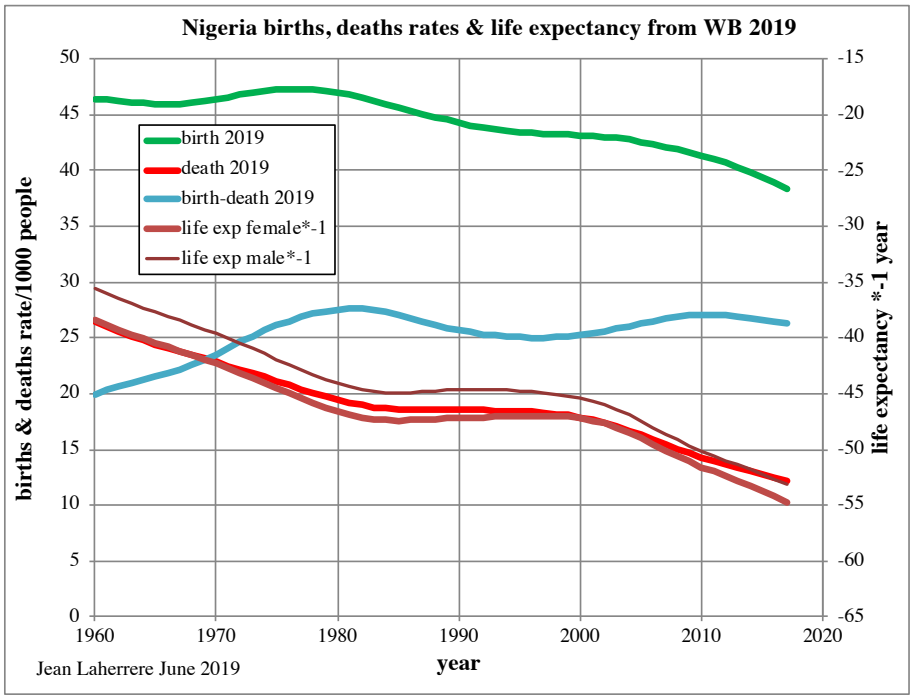
NGOs are bringing more medicaments than birth pills!



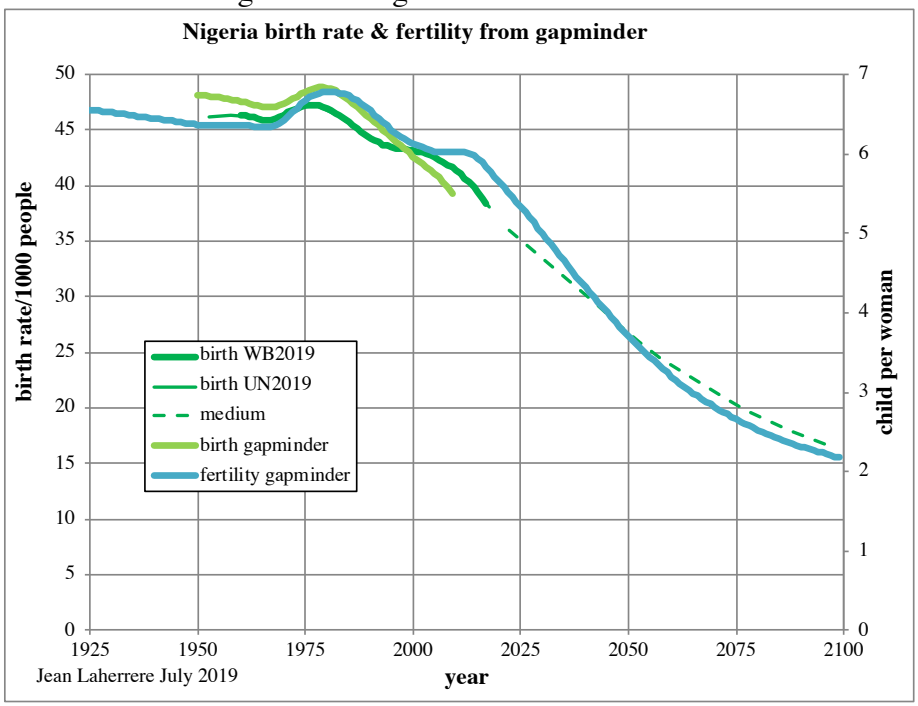
Nigeria birth rate is dropping less than death rate: it can be seen on the graph in log scale



Death rate from WB2019 varies in parallel with life expectancy multiplied by -1.



The birth and fertility rates are forecasted to drop to 15/1000 and 2 child per woman in 2100, but poor past forecast makes doubting such strong decline.



-Algeria

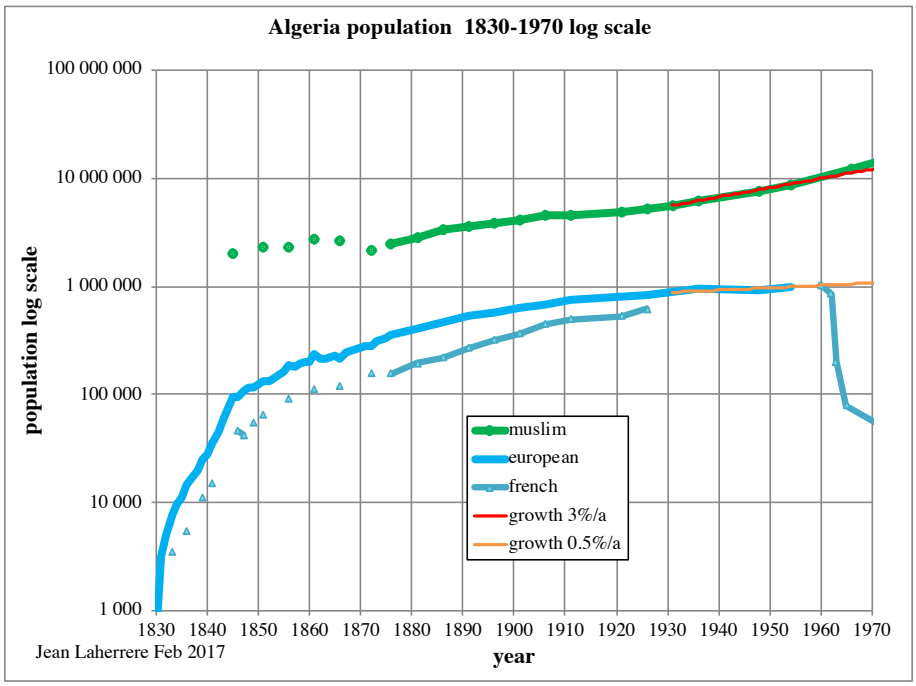
France was obliged in 1830 to conquer Algiers to remove the Ottoman regency in order to free European slaves.

Wikipedia:

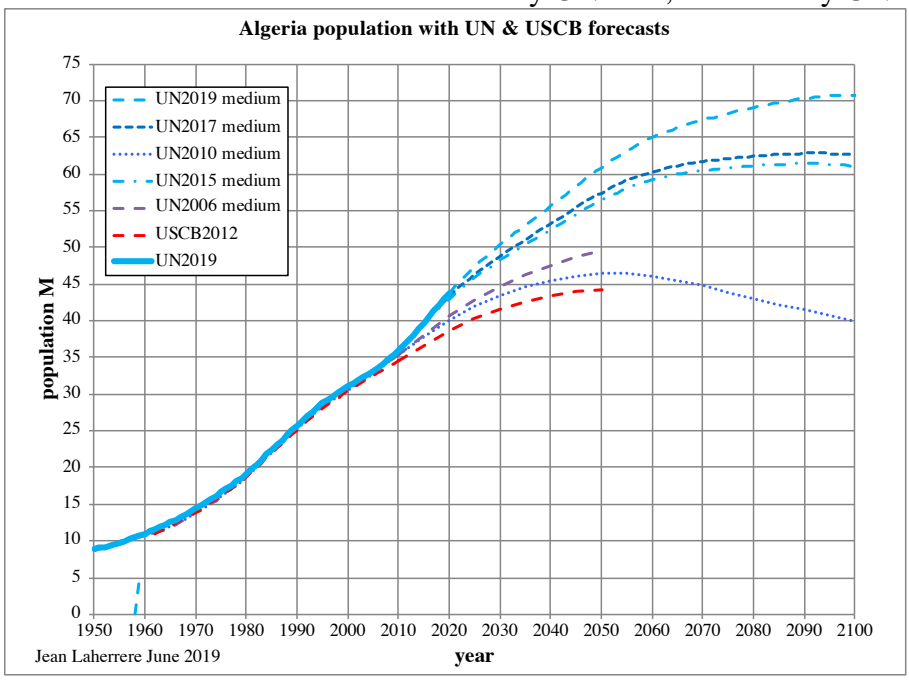
The Regency of Algiers was one of the main bases of the Barbary pirates and Barbary Slave Traders who attacked Christian ships and coastal settlements in the Mediterranean and North Atlantic. Like the rest of the Barbary Coast, the Regency of Algiers lived from the trade of slaves or goods captured from Europe, America and sub-Saharan Africa. The European powers bombarded

Algiers on different occasions in retaliation and the United States provoked the Barbary Wars in order to put an end to Algerian privateering against Christian shipping

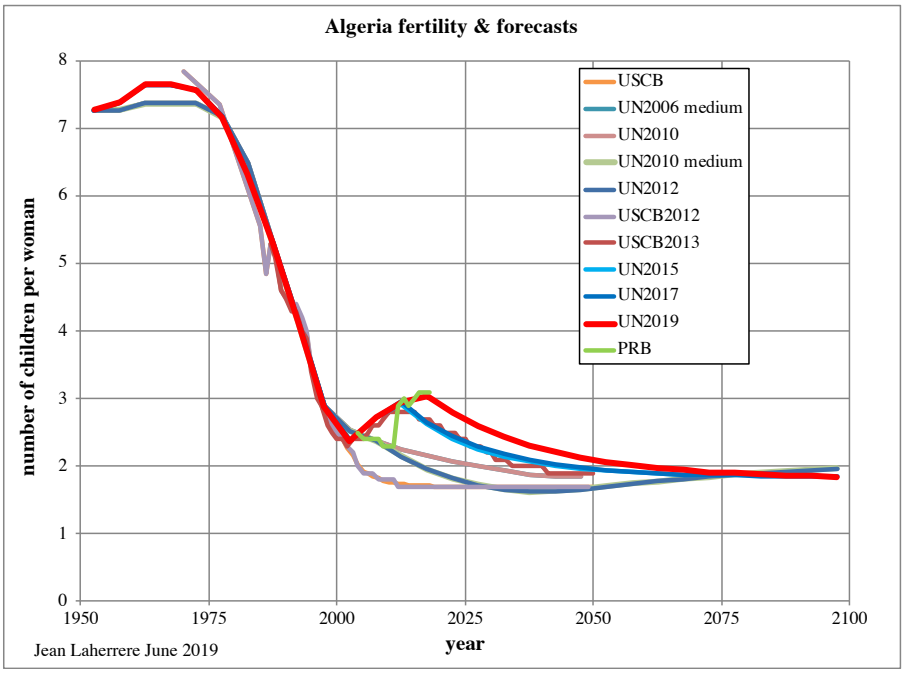
European population in Algeria has increased from 1830 from zero to 1 M in 1950, but muslim population has increased from 1930 to 1950 at 3%/a against only 0.5%/a for European population



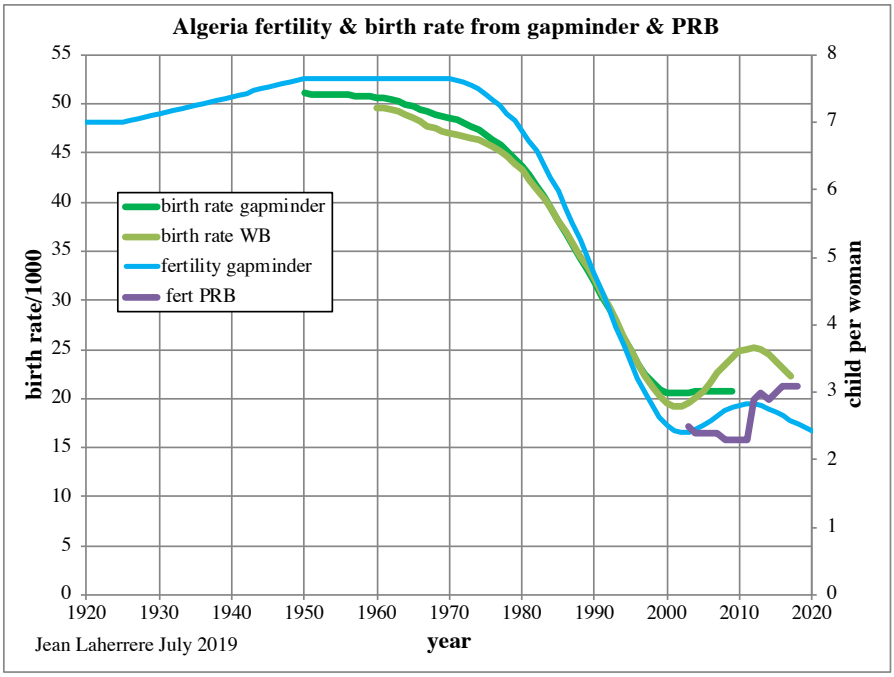
Algeria population was forecasted to be in 2100 40 M by UN2010, but 71 M by UN2019



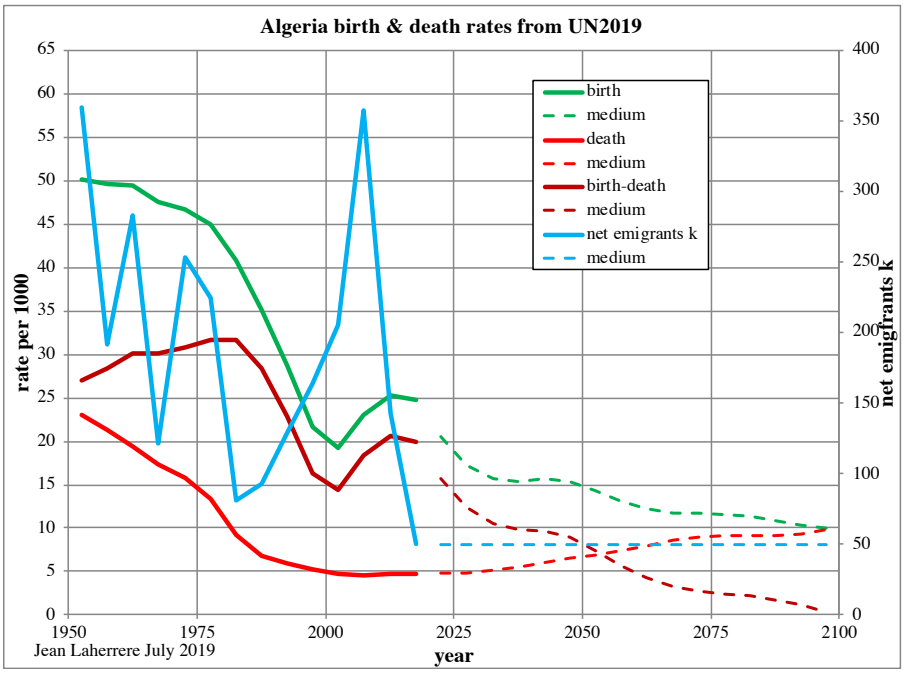
Algeria fertility dropped from 1975 to 2000, but has increased from 2001 to 2018



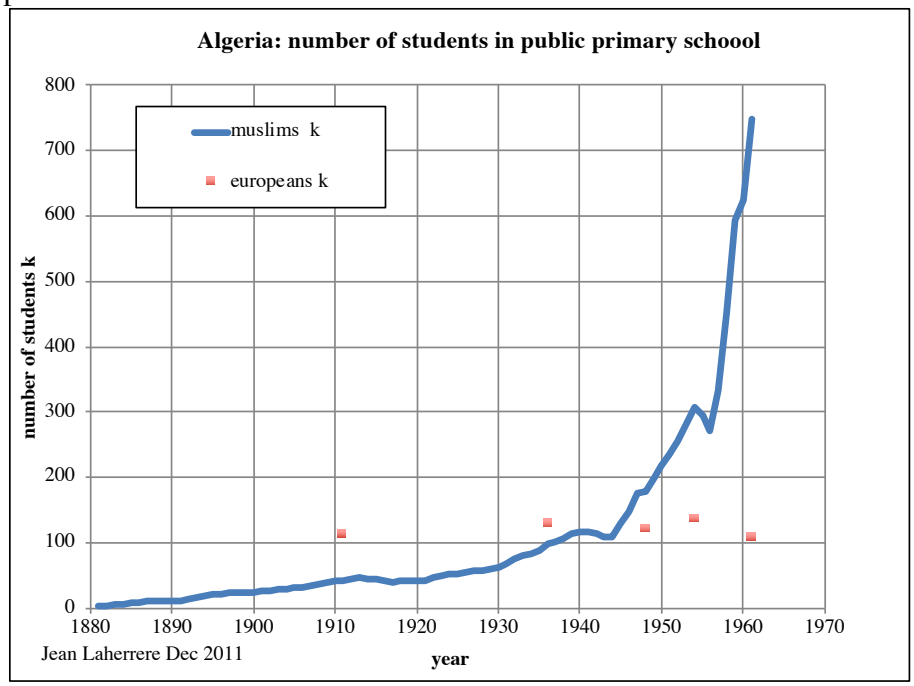
UN2019 forecasts a decline in fertility in 2019, but PRB data shows increase in fertility in 2018 to 3.1 children per woman.



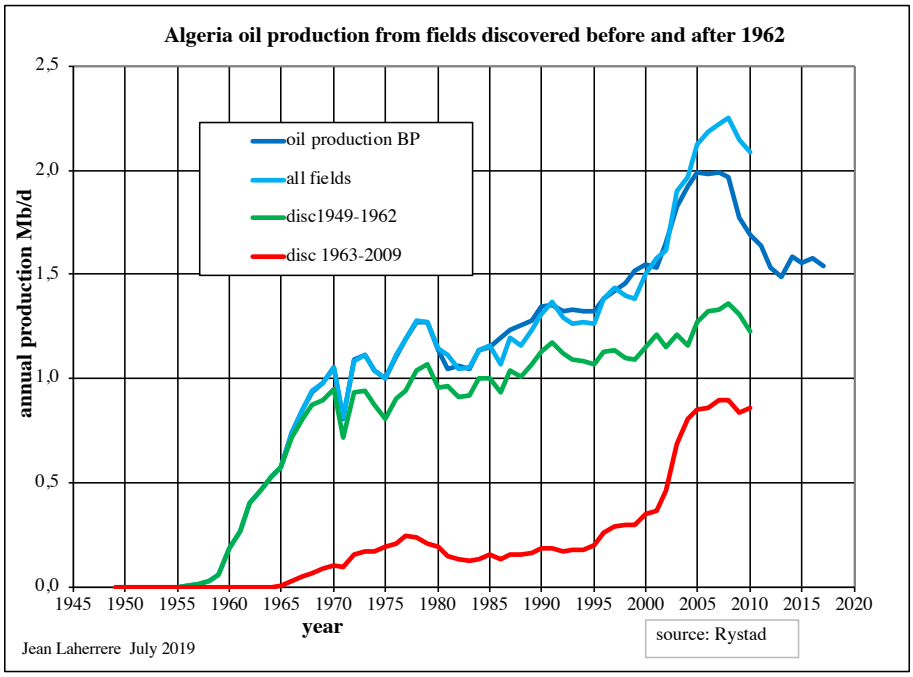
UN2019 birth rate has declined from 1950 to 2000 and increased from 2000 to 2015, but the recent decline is unreliable compared to fertility from PRB, as the future decline.
Death rate has declined and is flat since 1995.
Net emigrants have declined from 1950 to 2000, but high in 2005-2010: above 350 k. The value of 50k for the period 2015-2100 looks as pure guess and uncertainty of forecasting emigration.



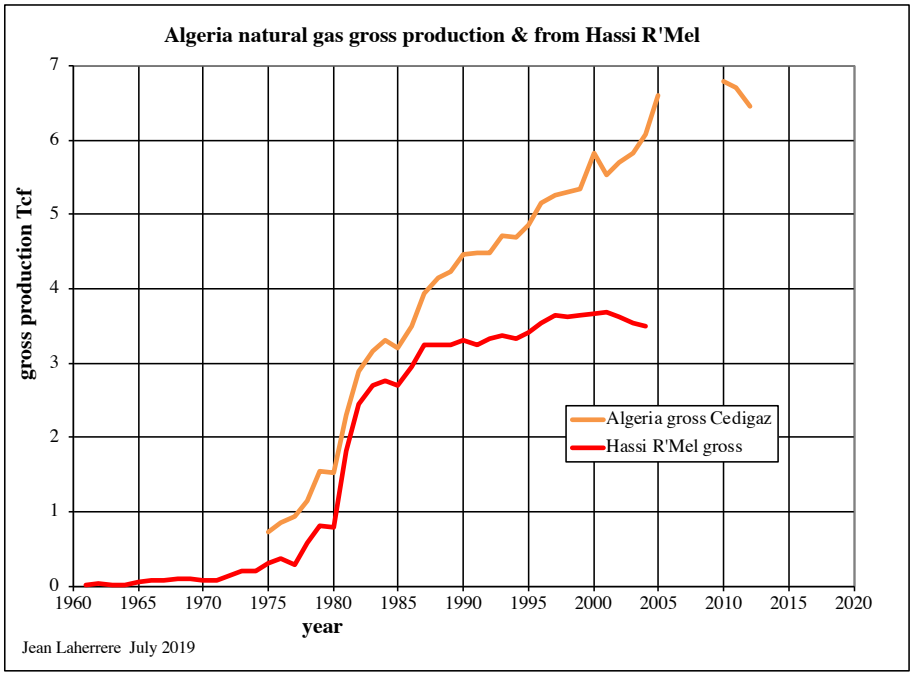
It is interesting to study the education for the period 1830-1962.
The number of students in primary school has much more increased for Muslims than for Europeans, in particular after 1945



Algeria oil production from fields discovered before independence (1962) (in green) is more than from fields discovered after 1962. The largest oilfield in Africa is Hassi Messaoud discovered in 1956



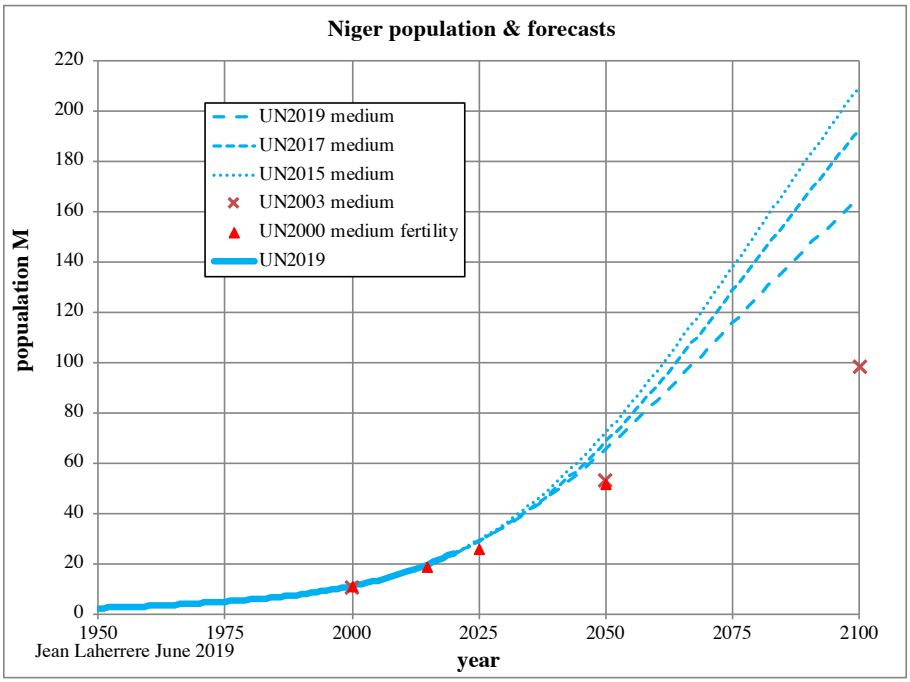
A large majority of Algeria natural gas production comes from the field of Hassi R'Mel discovered in 1957



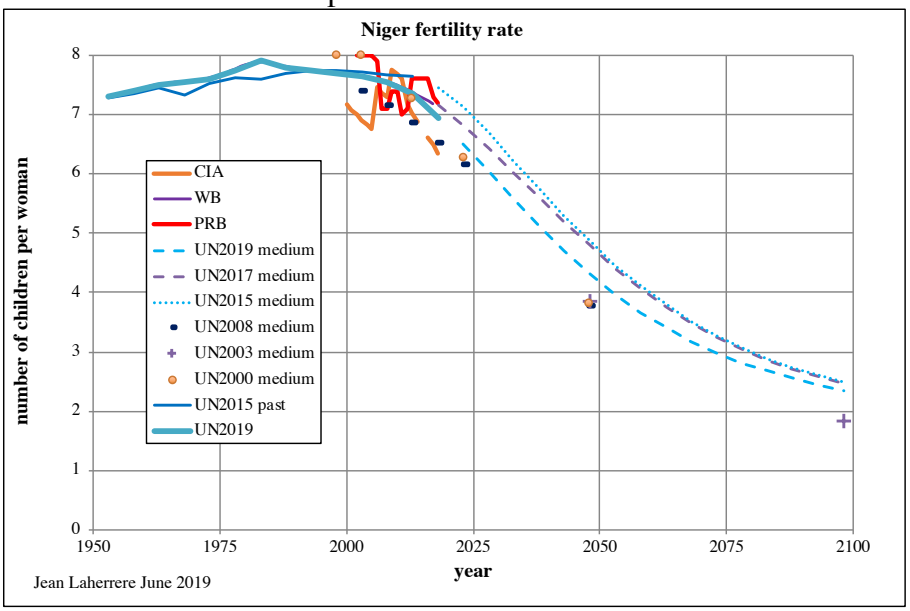
Half of the Algeria present budget comes from the production of Hassi Messaoud and Hassi R'Mel fields. I have participated in their discovery as geophysicist mapping their structure: Laherrere J.H. 2014 "Refraction sparked huge African discoveries" AAPG Explorer September p 48
Laherrere J.H. 2014 "History of the French discoveries in the Sahara" Sept http://aspofrance.viabloga.com/files/JL_2014SaharaLong.pdf.

-**Niger**

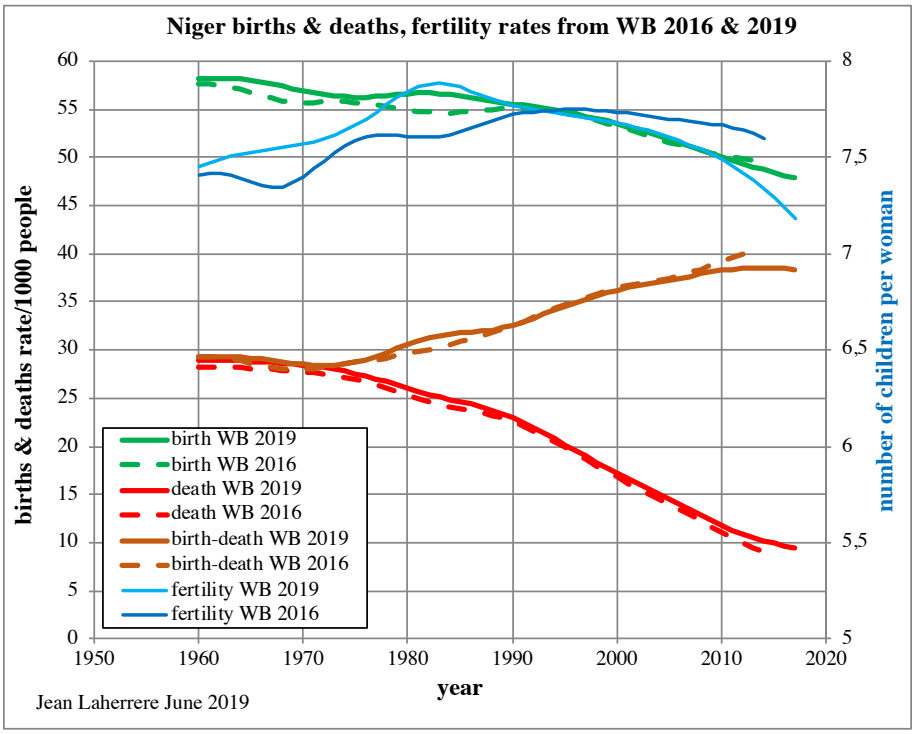
Niger has the highest fertility rate and the population forecast for 2100 has varied from 100 M for 2003 medium to 209 M for UN2015 medium and 163 M for UN2019medium.



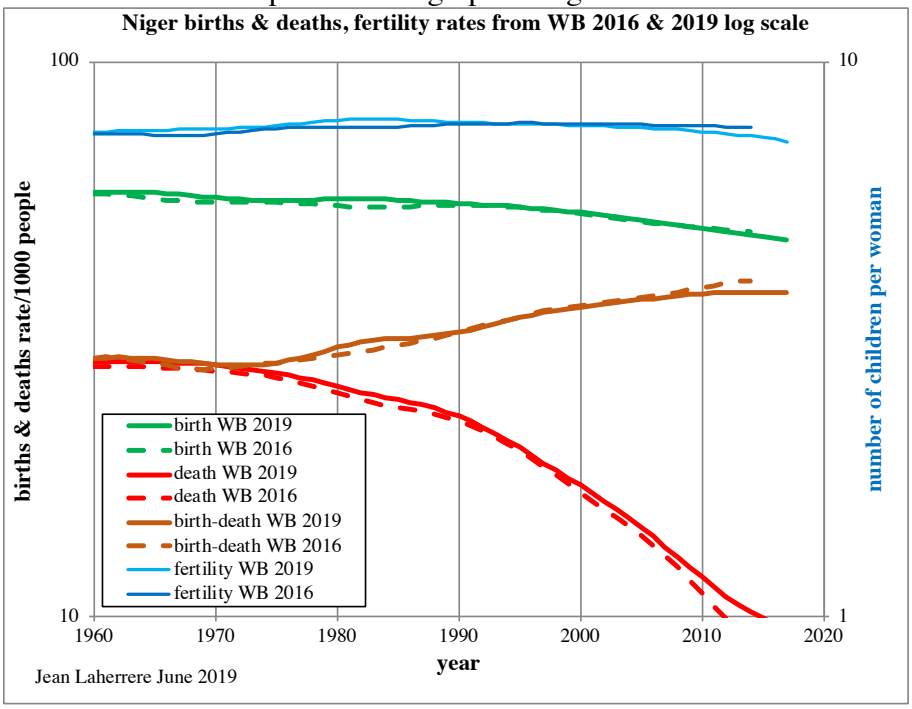
Niger fertility rate was forecasted too low in the past and today.
UN2019 medium is lower for 2018 compared to PRB.



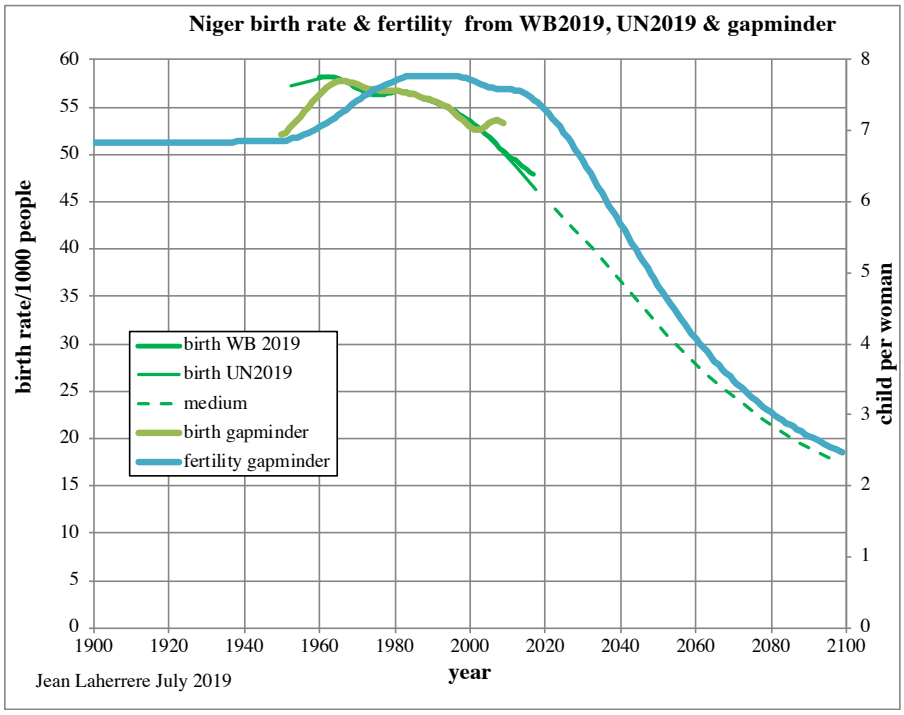
WB2019 displays a slow decline of birth rate and a steeper decline of death rate.



The slope of decline should be compared in the graph in log scale.

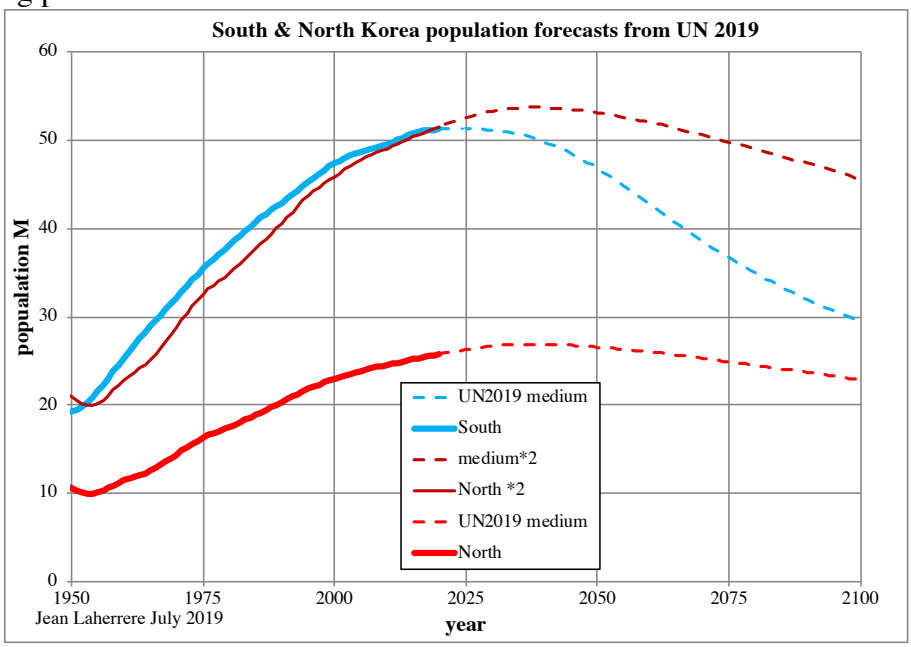


The correlation between birth rate and fertility is not as good as for most countries, meaning the difficulty of getting good data in this country

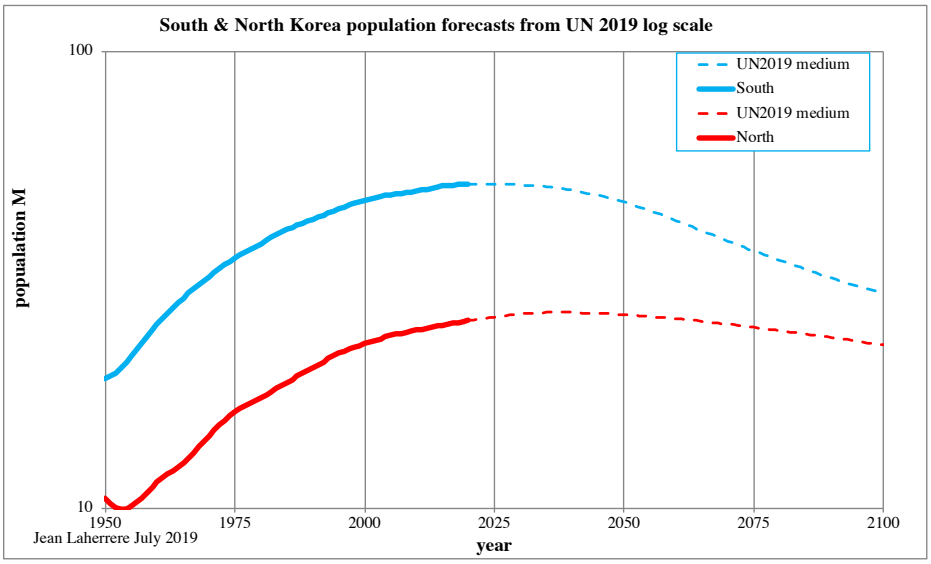


-**South & North Koreas**

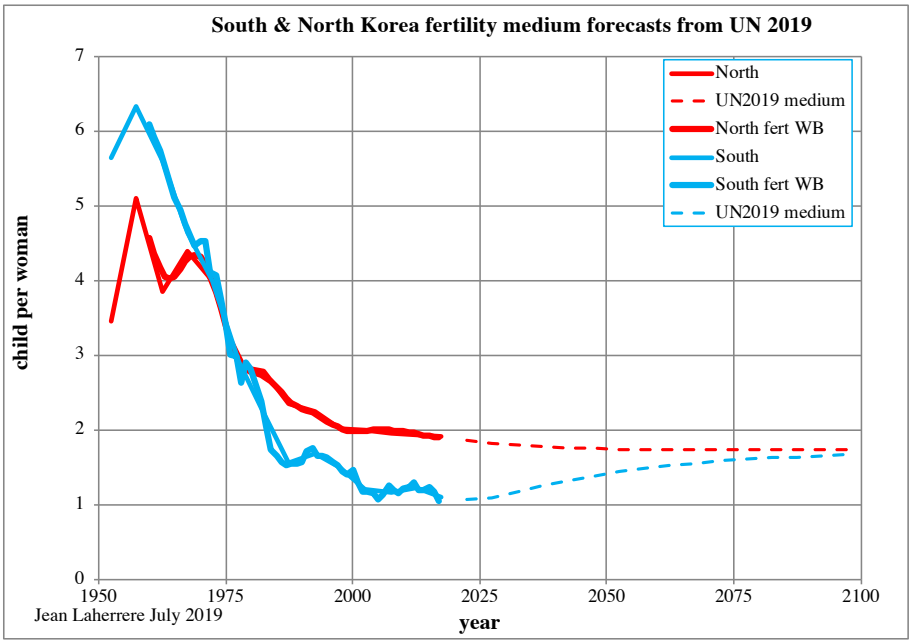
South (Republic) and North (Democratic Republic) Korea population forecasts from UN2019 display a coming peak for both countries.



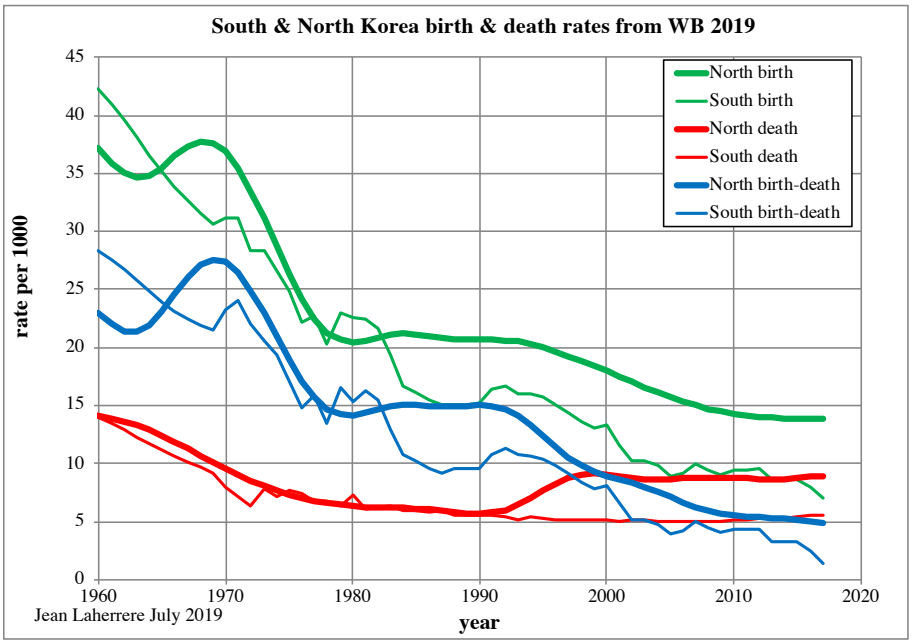
In log scale the rise of both countries (South being about double North) are parallel, but the coming decline is sharper for South than for North. The double of North is compared with South



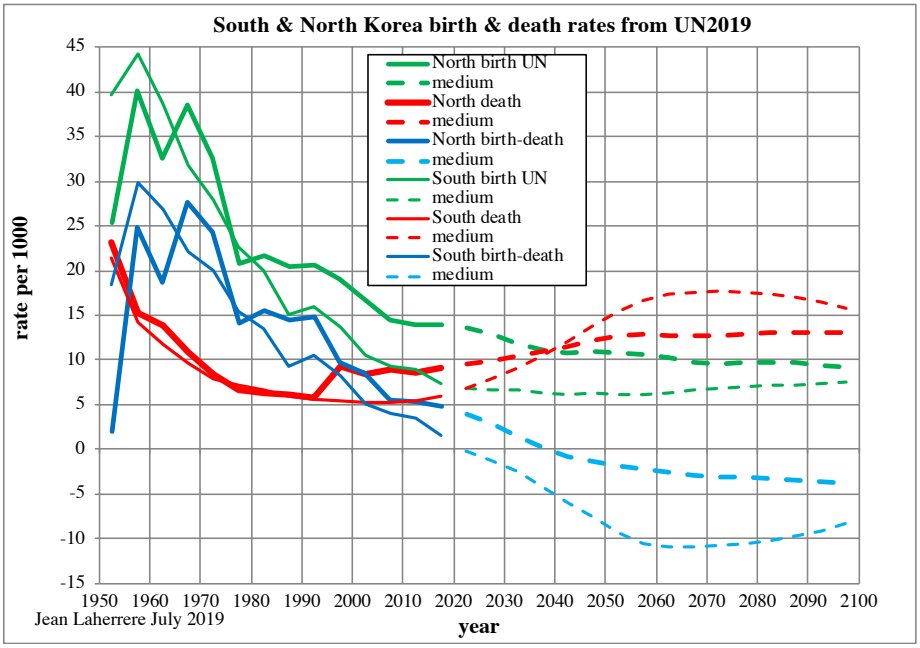
South Korea fertility was higher but declined sharper than North from 1960 to 1985, but since 2005 both flat. South fertility is forecasted to increase to be equal to North in 2100: wish or based on fact?



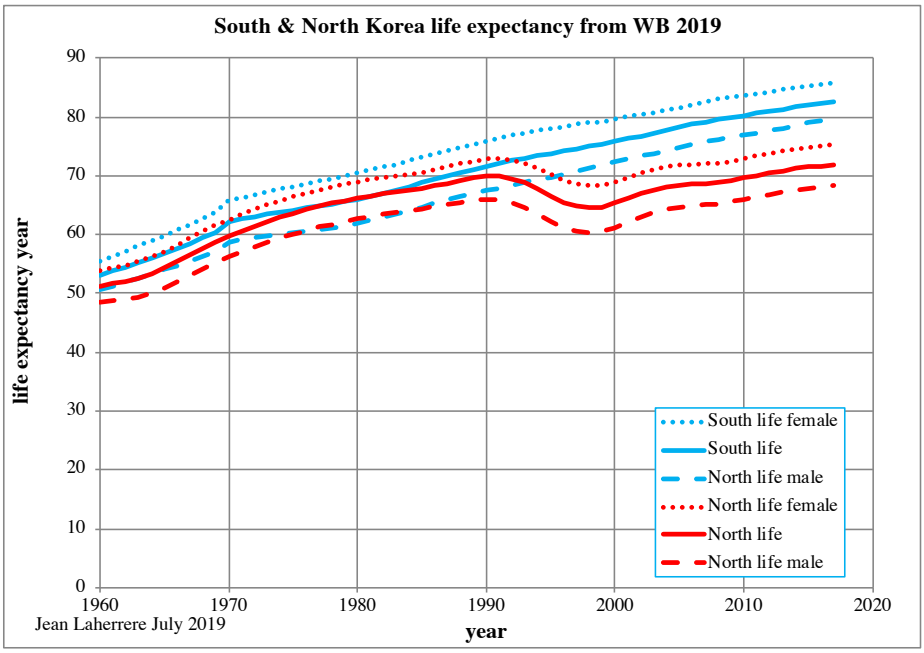
From WB 2019, birth rate (per 1000) have declined for South as for North Korea, but more for South, but it is surprising to see similar death curves for the period 1960-1990 and the increase of North from 1992 to 1997 from 6 to 9 when South death rate stays around 5 since 2010.
Will South death rate increase in the future or North death rate decrease?



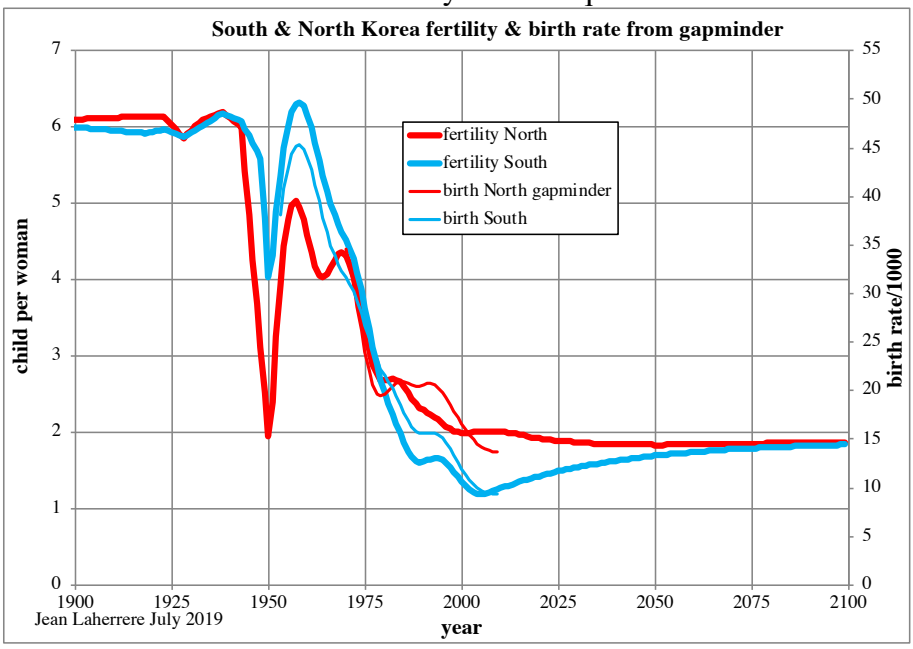
UN2019 forecasts that South death will increase much more than North death and will overpass it in 2040.



It is surprising to see North life expectancy, equal to South life expectancy from 1960 to 1990, decreasing by ten years, when South continue to increase. This discrepancy was attributable to increased gaps in mortality among children younger than 1 year and adults 55 years of age or older

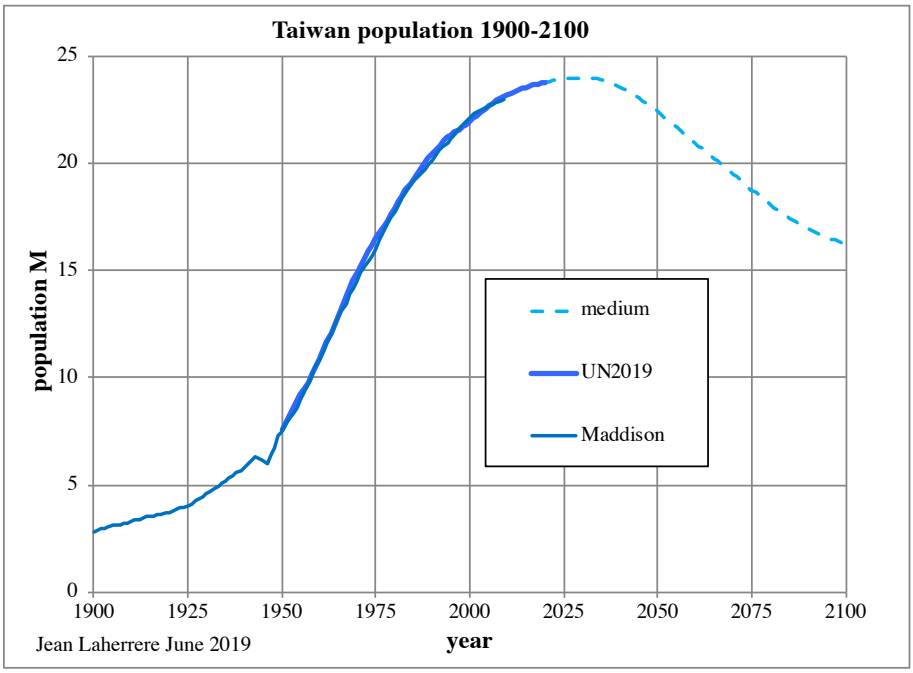


Gapminder forecasts that South and North fertility will be equal in 2100: it looks an unlikely wish.

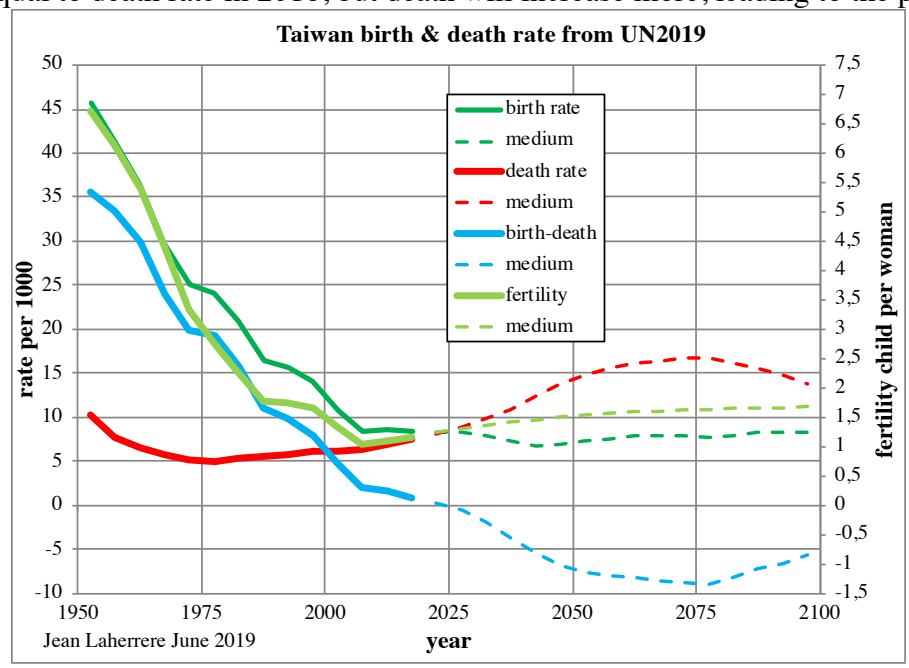


-Taiwan

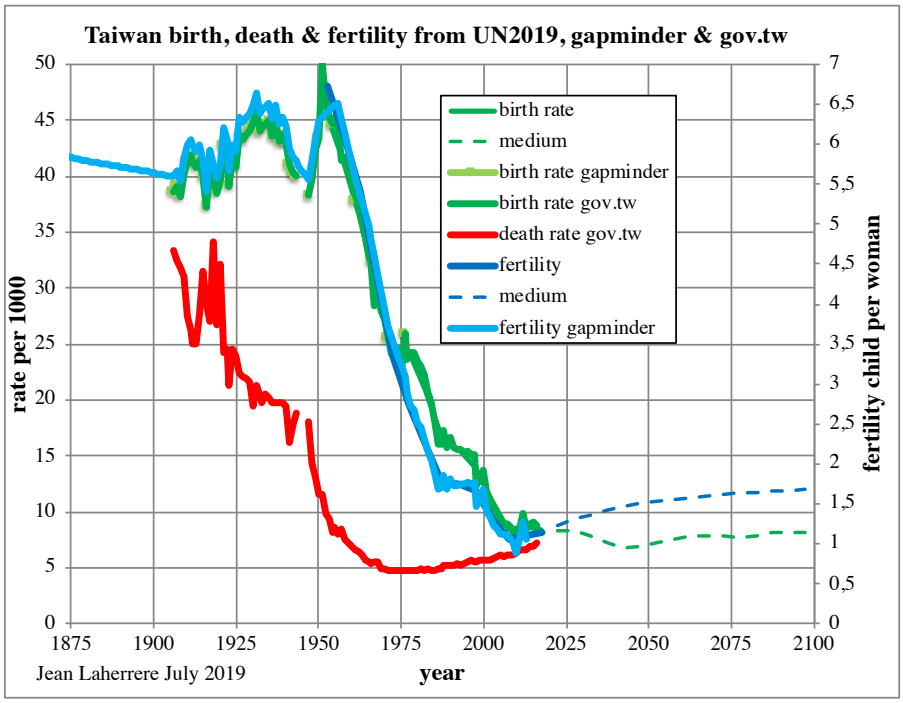
Taiwan population is peaking in 2030 at 24 M and will be 16 M in 2100 (medium d fertility)



Birth rate is equal to death rate in 2018, but death will increase more, leading to the peak.

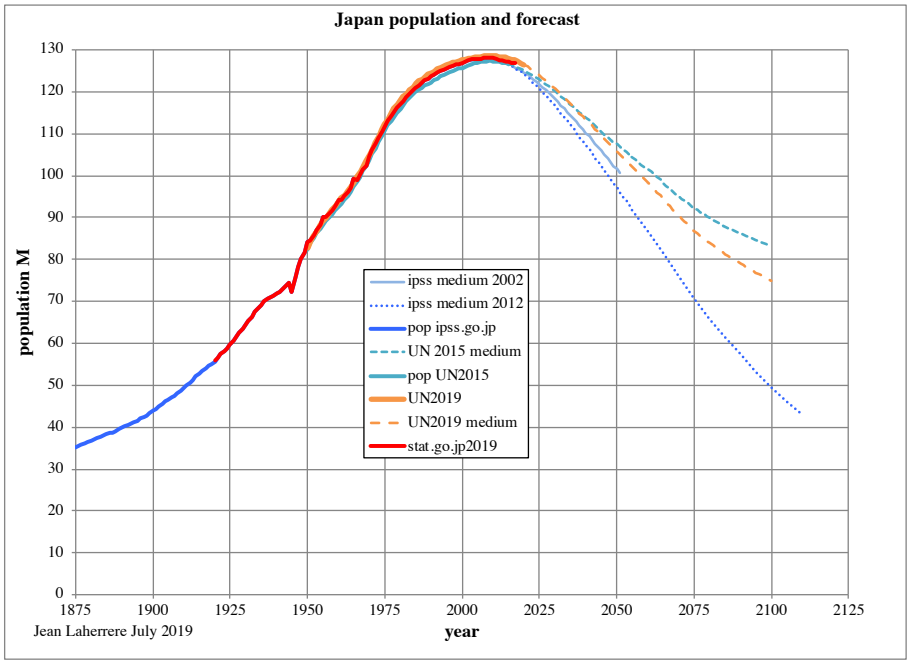


Birth rate coincides with fertility from 1900 to 1970, but not for 1970-2015.

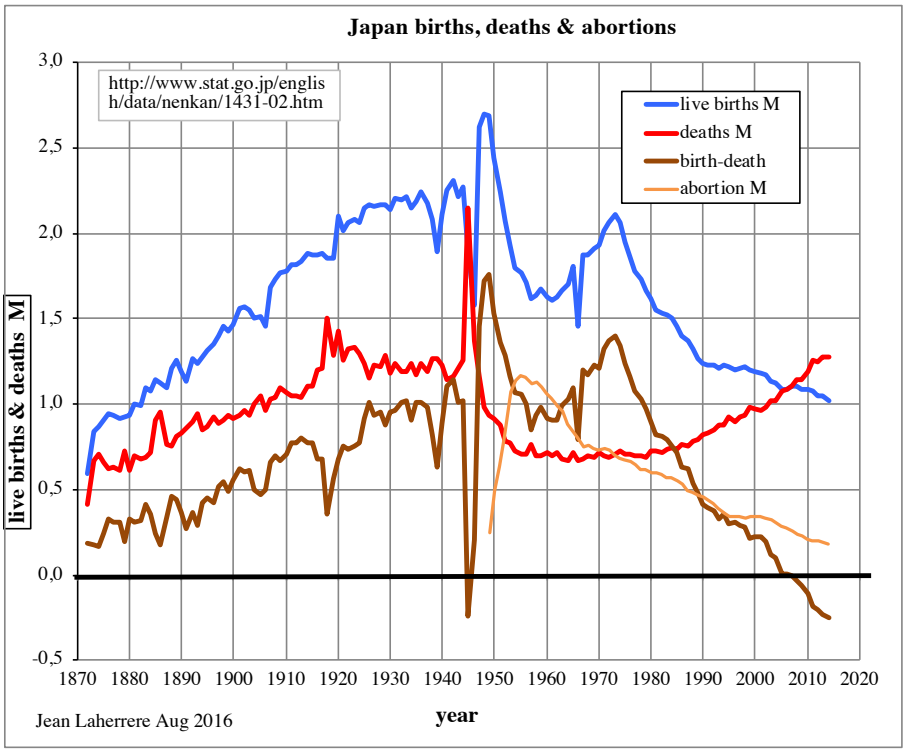


-Japan

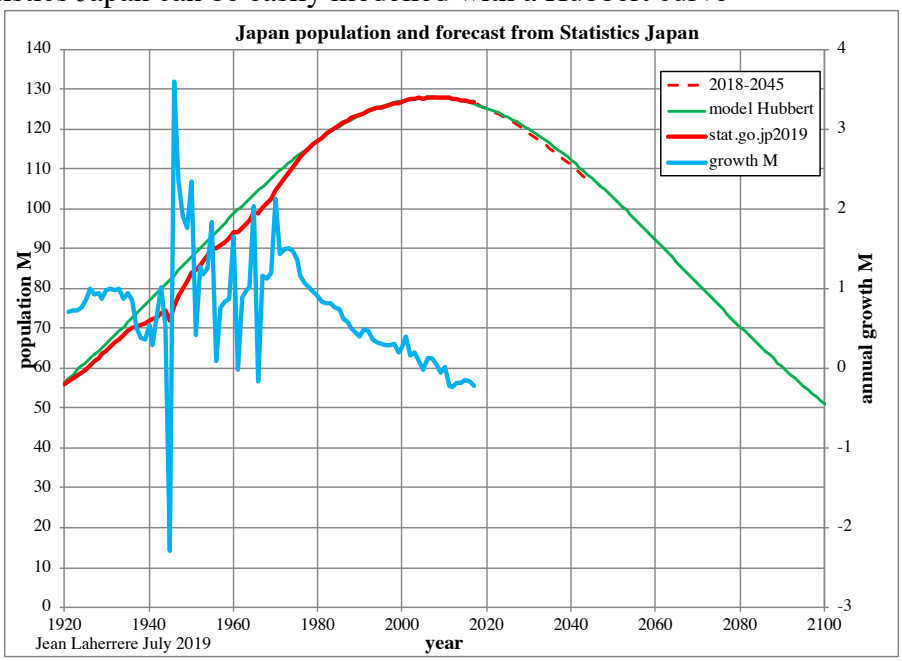
Japan is a good example of population peak in 2009. The lack of significant migration makes forecast easier.



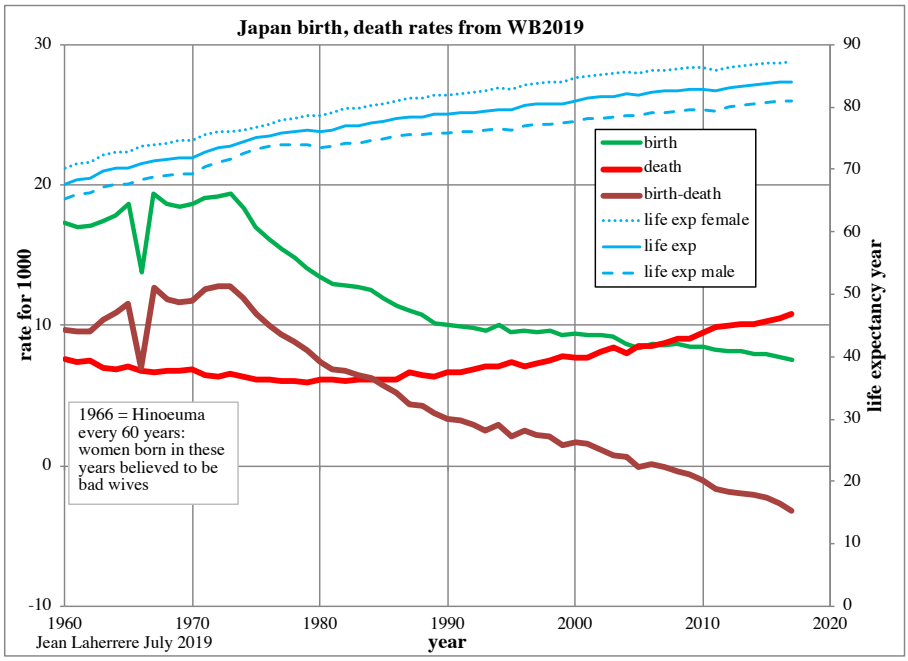
Abortion was used strongly from 1954 to 1967 but has steadily declined since and the data is not anymore provided!



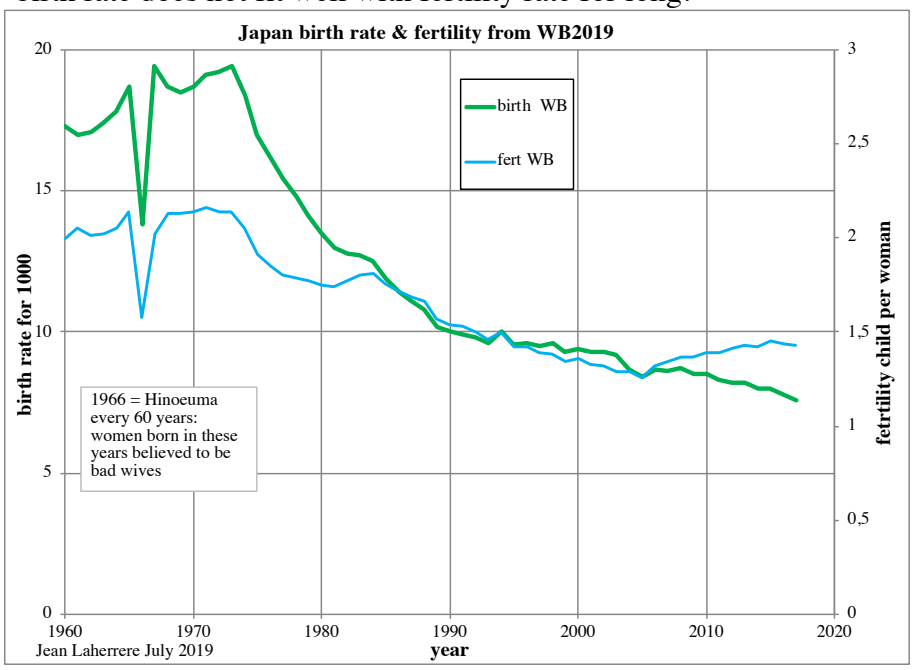
Data from Statistics Japan can be easily modelled with a Hubbert curve



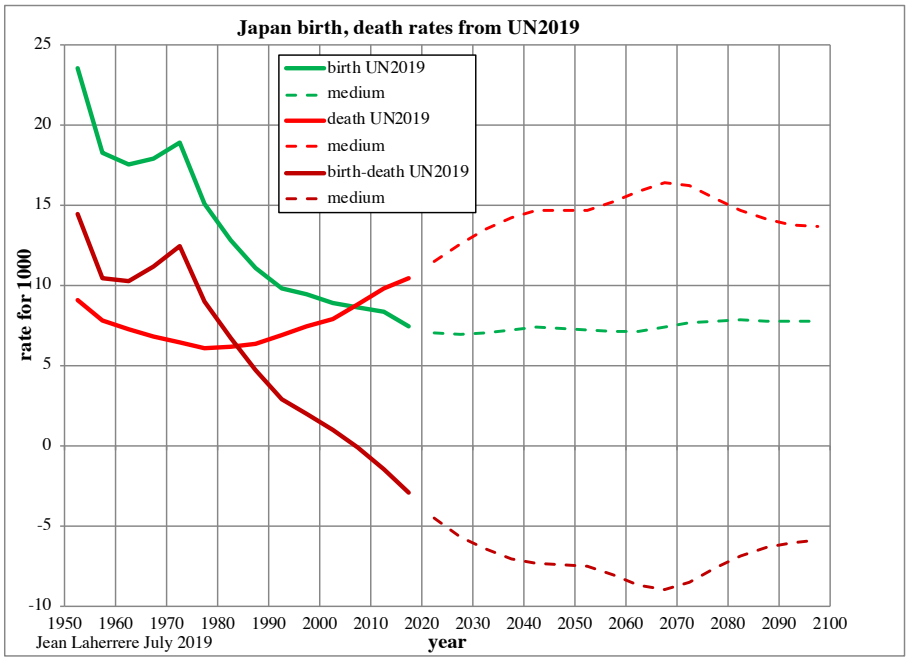
In 1966 there is a sharp drop on birth rates because in Japan every 60 years occurs Hinoeuma (fire horse) where women born on this year are assumed to be bad wife (in fact to kill and to eat their husband), so there is a sharp increase in abortion on thus year and less the years before and after. Will this irrational behavior occur in 2026?
But since 1979 the death rate has increased from 5.9 (per 1000) in 1979 to 10.8 in 2017, because the aging of the population.



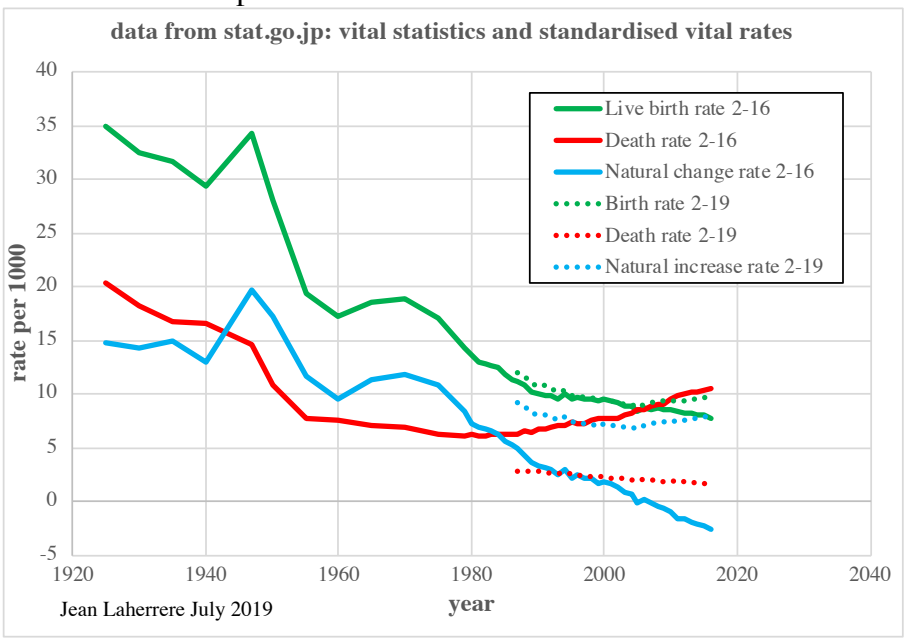
From WB2019 birth rate does not fit well with fertility rate for long.



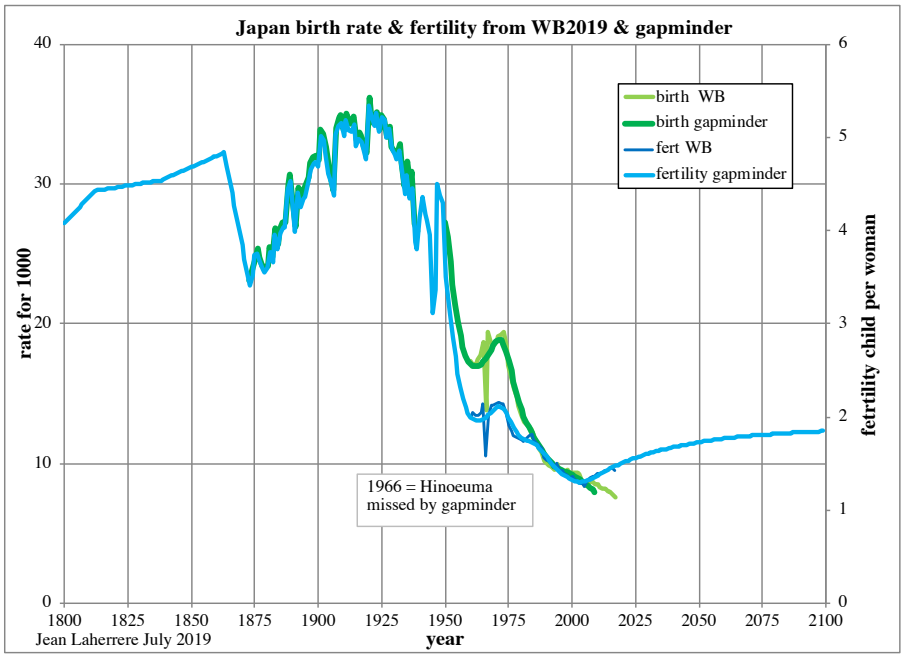
UN2019 forecasts a flat birth rate and an increasing death rate.



Stat.go.jp https://www.stat.go.jp/english/data/nenkan/68nenkan/1431-02.html reports vital statistics (2-16) and standardiased rates (2-19): they are similar for birth rates but different for death rates for a reason that I did not catch!
This shows that data can be manipulated!

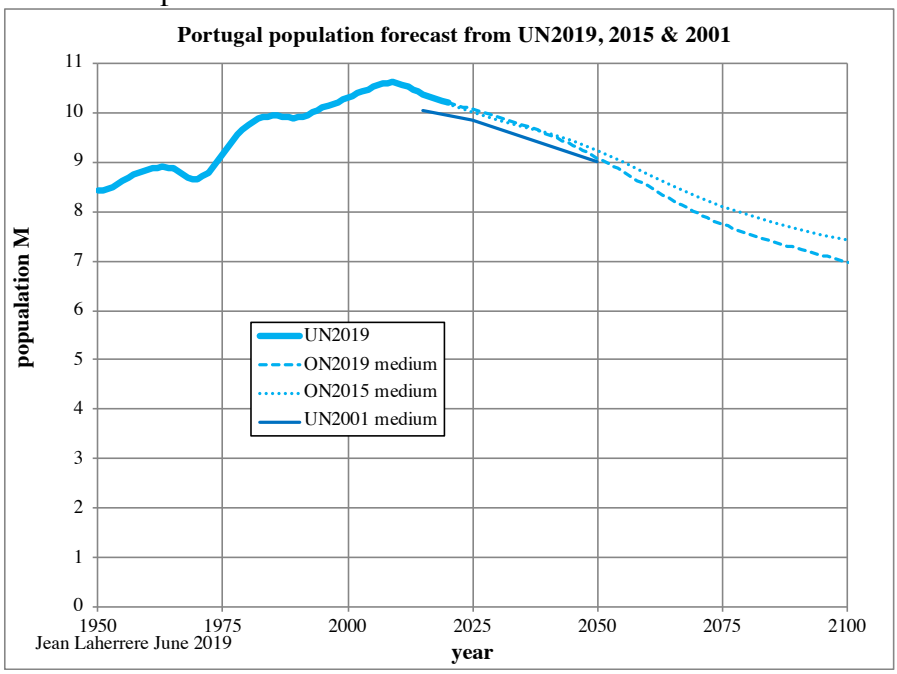


Gapminder fertility fits well with birth rate except for 1950-1985 and after 2010



-Portugal

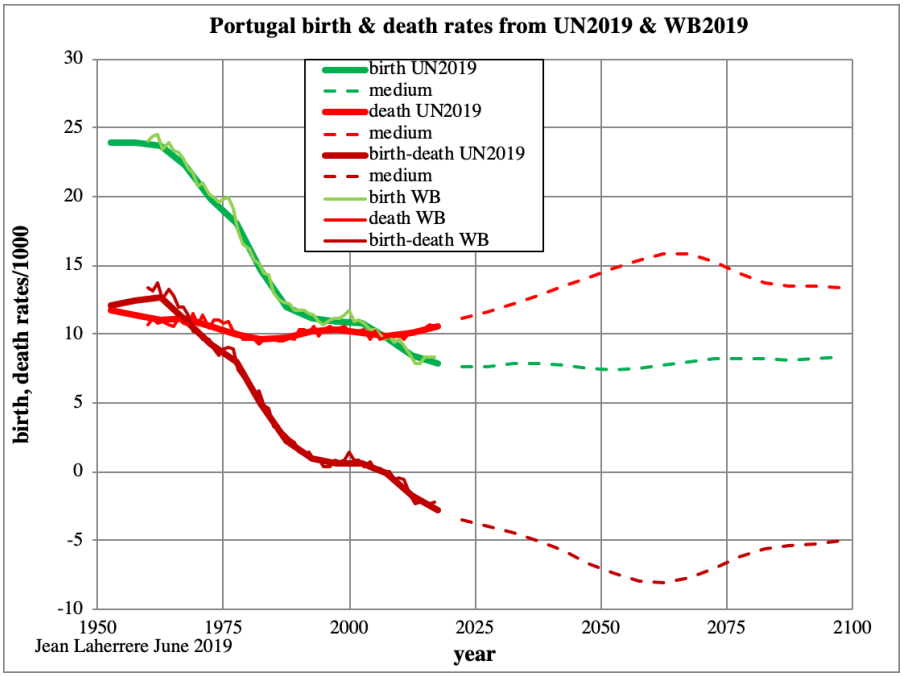
Portugal, as Ukraine, has passed population peak in 2010 at 10.6 M and will be at 7 M (medium) in 2100. UN2015 was more optimistic



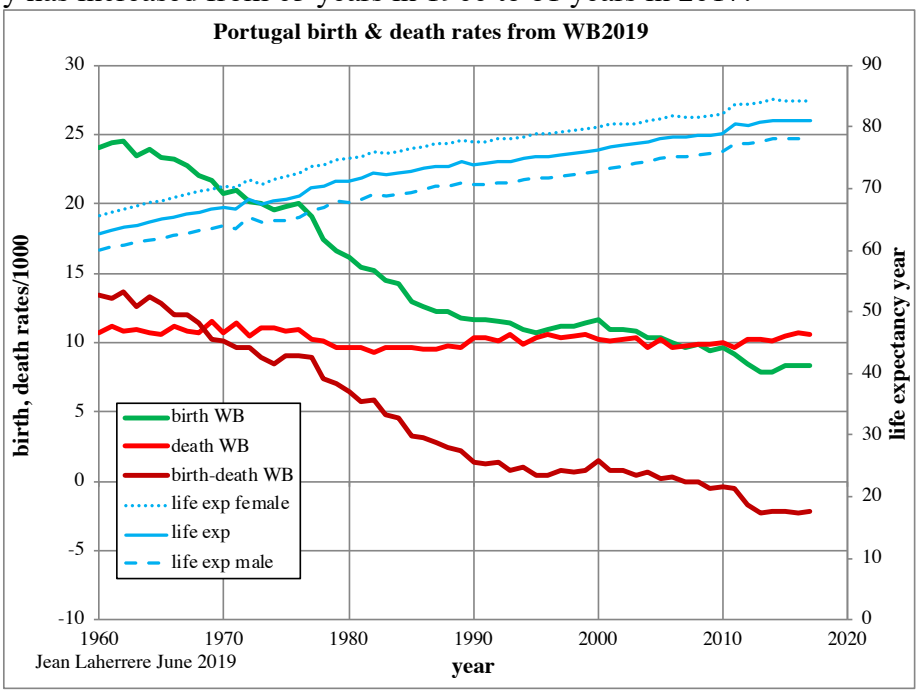
Birth rate declined from 24 to 8 from 1950 to 2018 and death rate overpasses birth in 2006 leading to the peak.

UN2019 forecasts death rate increasing until 2060 and decreasing after?

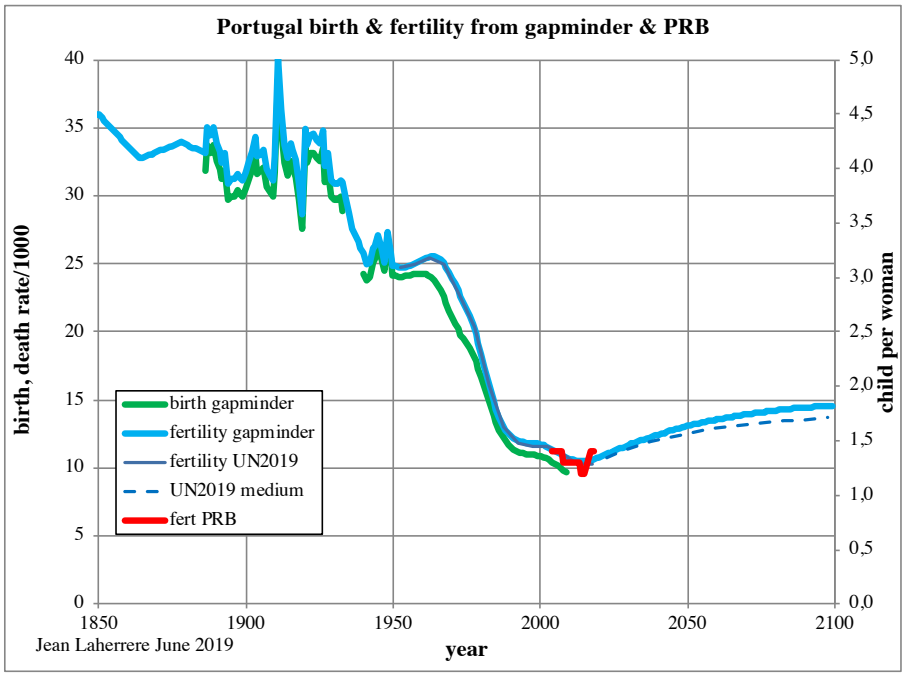
WB2019 reports a death rate almost flat at 10 (per 1000) since 1960



Life expectancy has increased from 63 years in 1960 to 81 years in 2017.

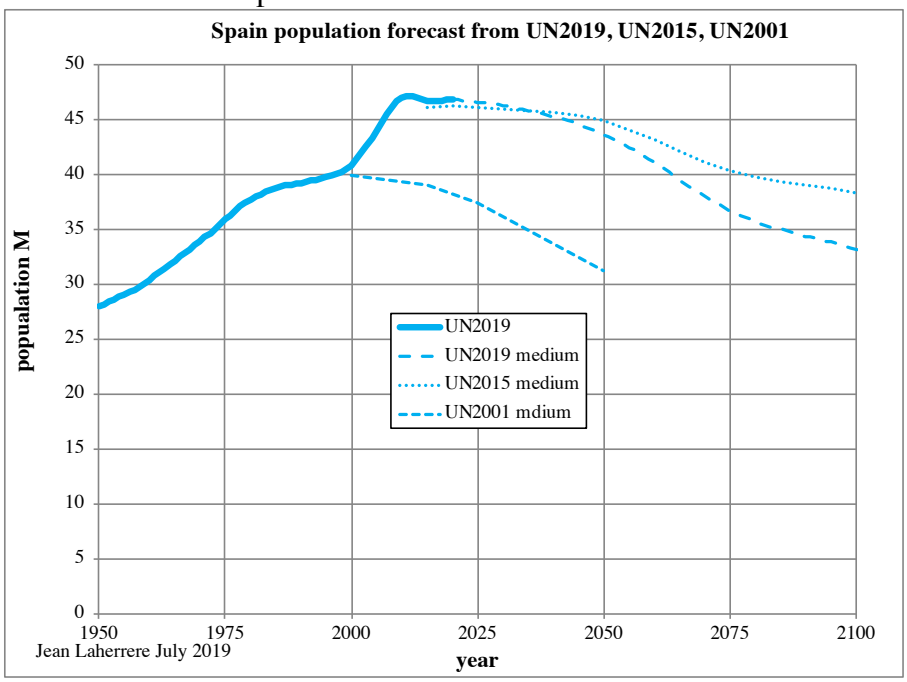


Birth rate and fertility have declined since 1927 to 2015 and are forecasted to increase up to 2100? Wishful thinking?

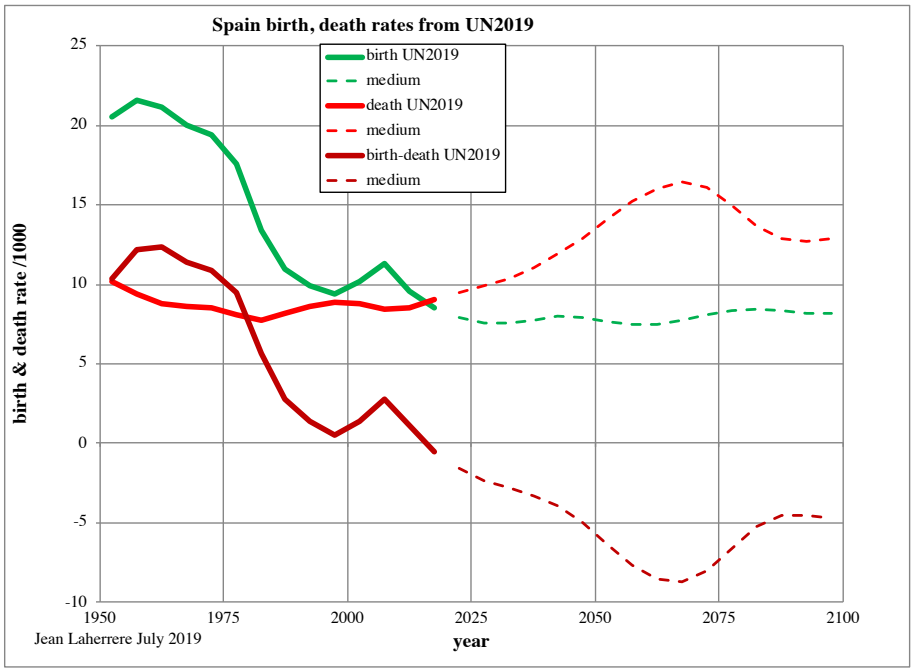


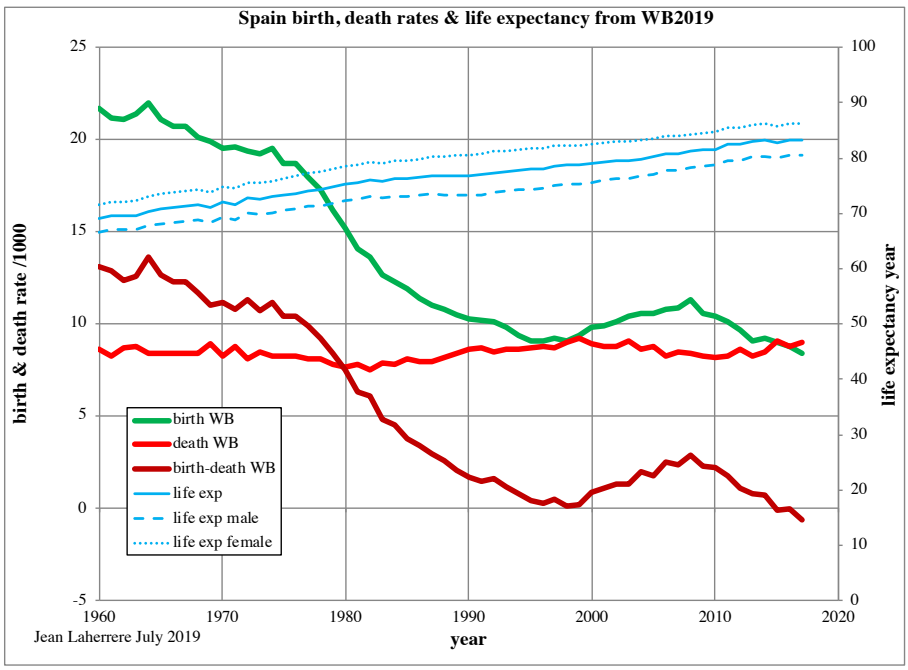
-Spain

Spain has peaked in 2011 over 47 M and is forecasted to be 33 M in 2100 by UN2019 medium.
UN2015 forecast was more optimistic with 38 M in 2100.
UN2001 medium was much more pessimistic.

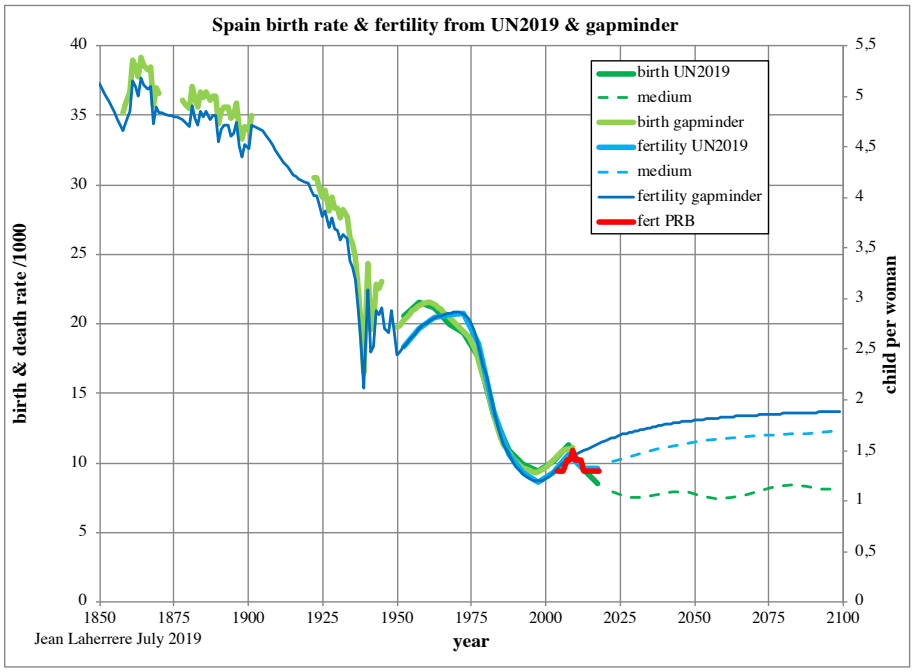


Birth rate declined from 20 to 10 from 1970 to 1990 and stays around,
Death rate stays around 8 from 1960 to now, but UN2019 forecasts about 16 in 2060.





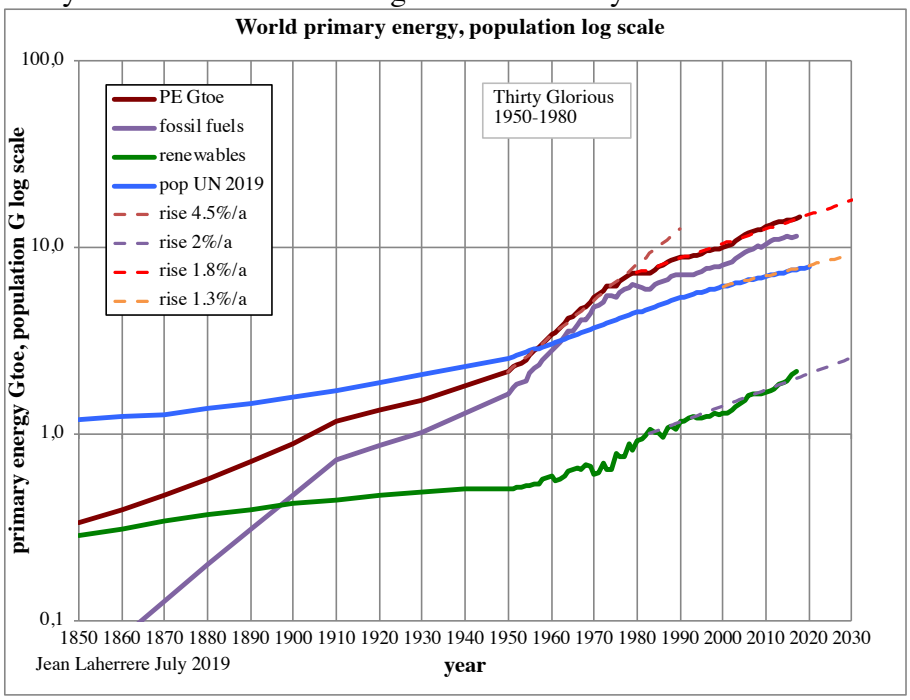
Spain fertility rate has dropped from 1900 (4.7) to 2000 (1.2), being at 1.3 child per woman in 2018, well below replacement value, explaining the population decline



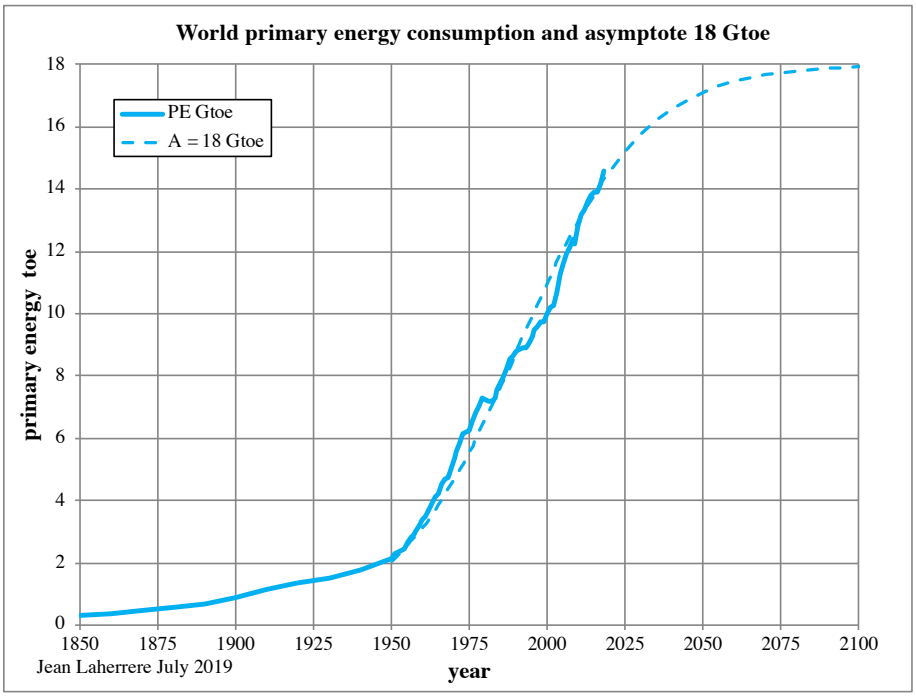
-**Population & primary energy**

Population and primary energy consumption should be compared using a log scale.

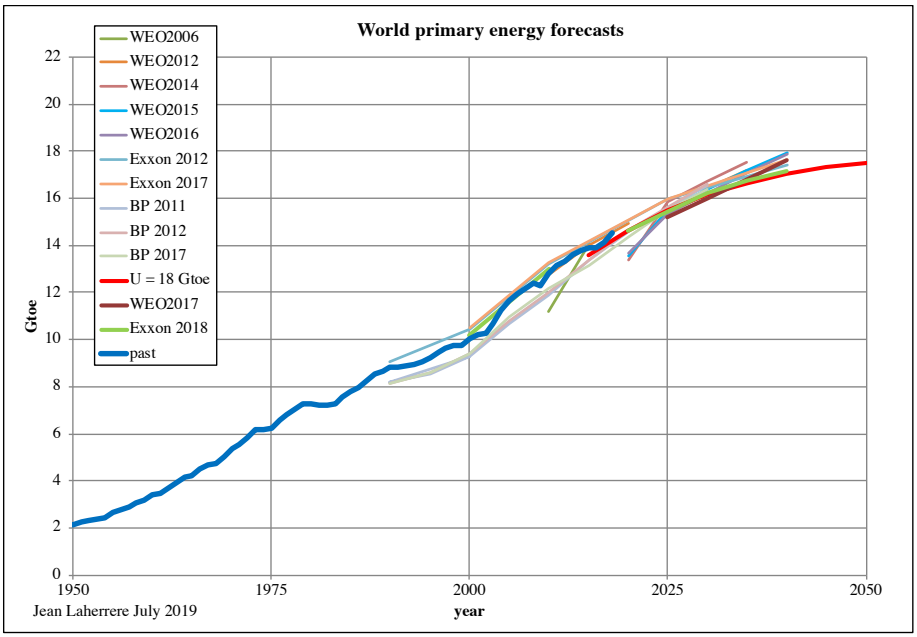
During the Thirty Glorious primary energy grew by 4.5%/a and beyond 1980 by 1.8%/a, population since 1990 grows by 1.3%/a and renewables grow since 985 by 1.8%/a.



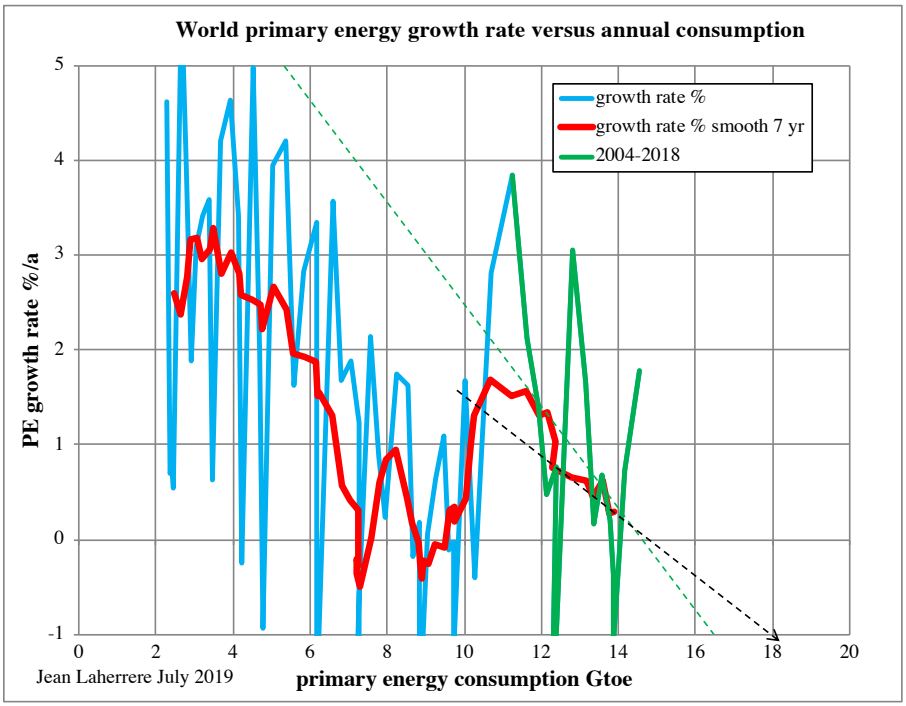
We forecast that primary energy will reach an asymptote of 18 Gtoe around 2100



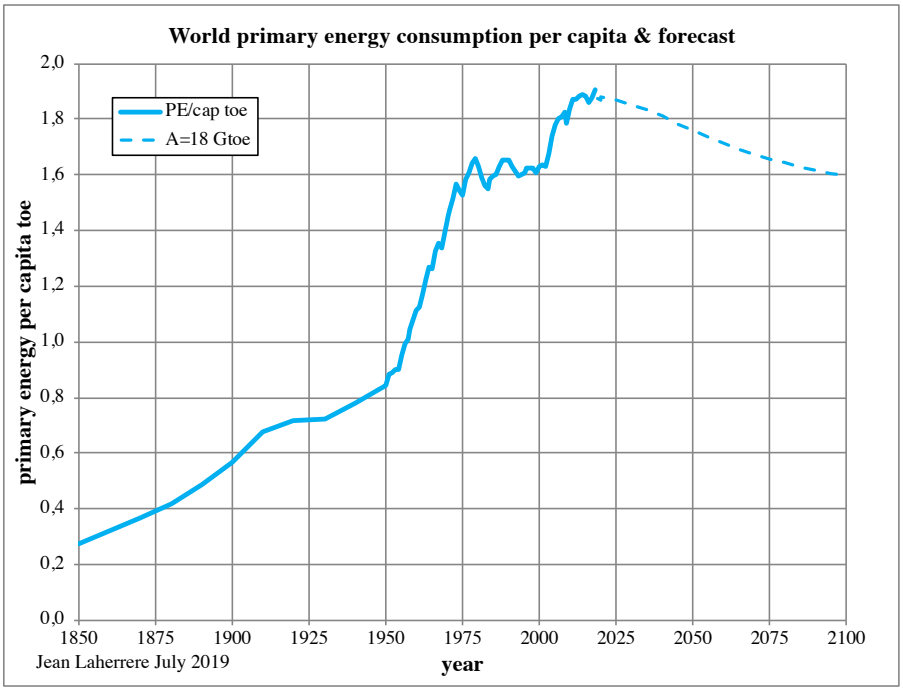
IEA/WEO2017 forecast for 2040 is higher than Exxon2018 forecast (light green) which is close to A = 18 Gtoe



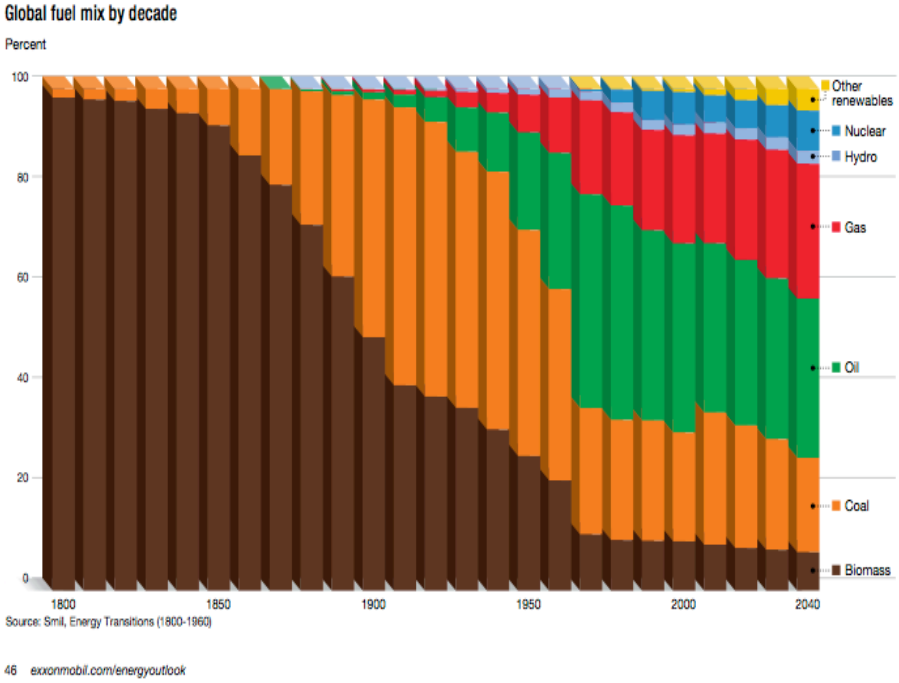
This 18 Gtoe asymptote is the linear trend of the growth rate percentage (smoothed by 7 years)
The growth rate % for the period 2004-2018 trends towards less than 17 Gtoe but it is very bumpy.



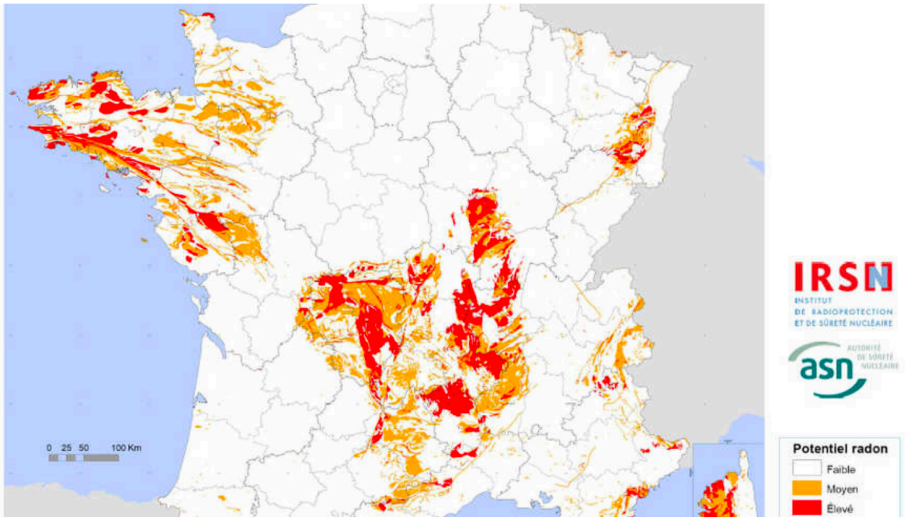
But the primary energy consumption per capita is still rising at today 1.9 toe/cap after a plateau at 1.6 toe/cap from 1976 to 2002
Consumers want to consume always more, but our earth is limited and one day a peak or an asymptote will be reached.
Our consumption society will be obliged to change for a society more respectful to Nature and her resources.
It is likely that the present consumption per capita at 1.9 toe /cap since 2010 will decline after 2025.
This decline will be the first since 1850, it means since the industrial time, energy use will decline: we are not used to diminish our energy use. We have to change our way of life!
Our present industrial society is based on always increasing energy use, coming mainly from fossil fuels.



In 1800 98% of the energy mix was from biomass (ExxonMobil 2017), in 2040 fossil fuels will still represent 77% of the energy mix.
ExxonMobil 2017 « The evolving energy mix" https://energyfactor.exxonmobil.com/perspectives/evolving-energy-mix/



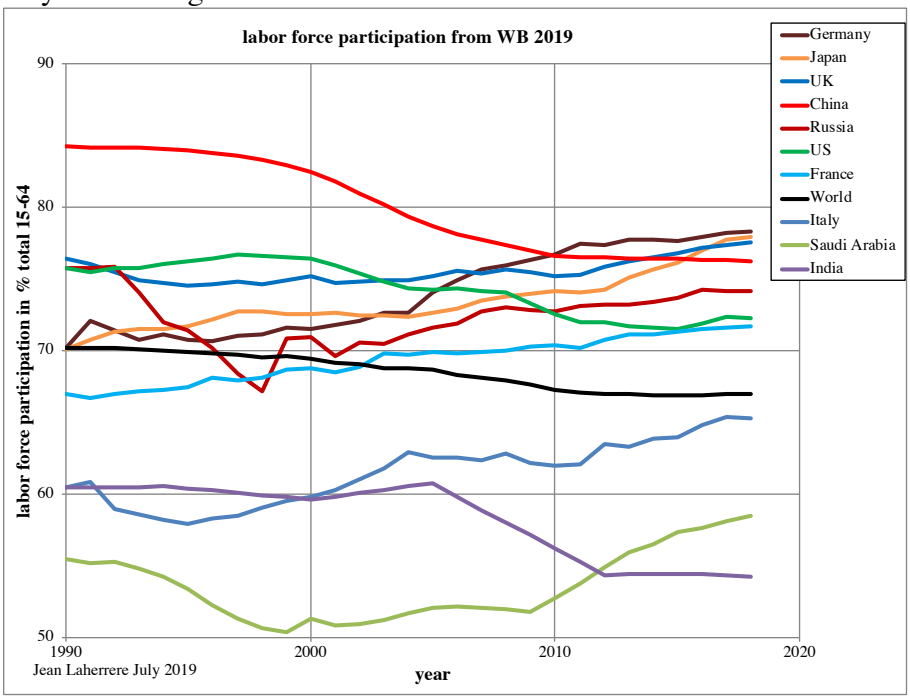
All the forecasts of zero carbon in the near future looks unrealistic! Intermittency of renewables, as long as electricity cannot be stored easily, prevents all the crazy dreams of zero carbon!
Many forgot that life comes from the sun and the chlorophyll and with no CO2, there is no chlorophyll, no oxygen.
Zero carbon (or post carbon) goal is stupid. The percent in mass in our body is: oxygen 65%, carbon 18.5 %, hydrogen 9.5 %, nitrogen 3.2 %, calcium 1.5 %, phosphorus 1%.
Like to goal of no radioactivity, our body (because in particular of potassium) has a radioactivity of 8000 becquerels and the radioactivity of radon (from granite) is high in certain parts of France.
Zero radioactivity is impossible.



Carbon and radioactivity belong to Nature and have to be accepted as birth and death.

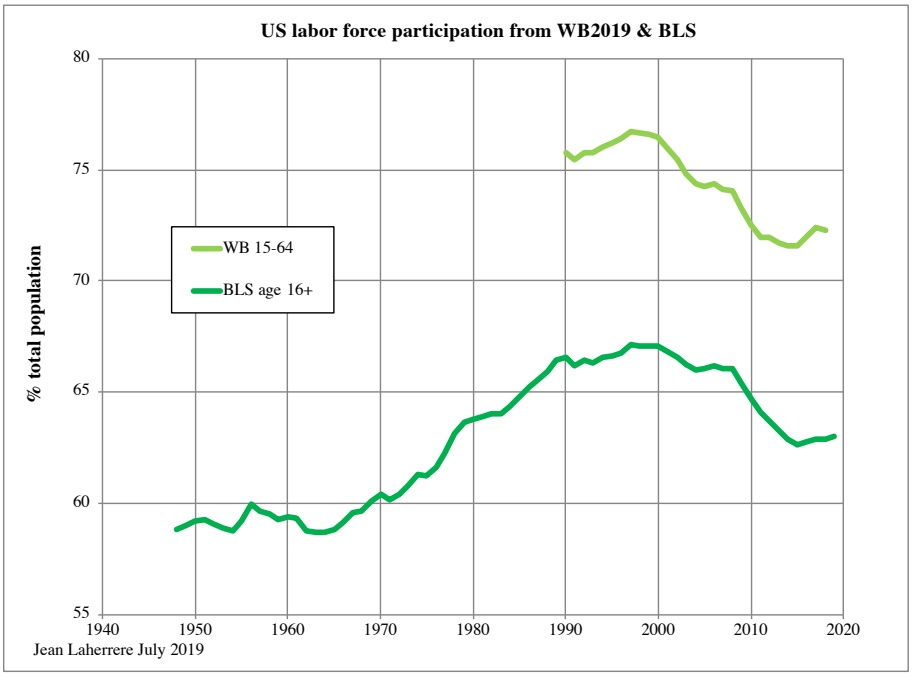
-**Labor force participation**

From WB2019 for the period 1990-2018, labor force participation in % of total 15-64 years is plotted for some countries.
China, US, India and world curves are declining when in contrary Germany, UK, Russia, France Italy & Saudi Arabia are growing.
It is surprising to see the US labor force percentage declining when Trump claims that the US is in better shape than before, in fact many unemployed US workers do not register!
For 2018 Germany has the highest % with 78% and India the lowest with 54%!

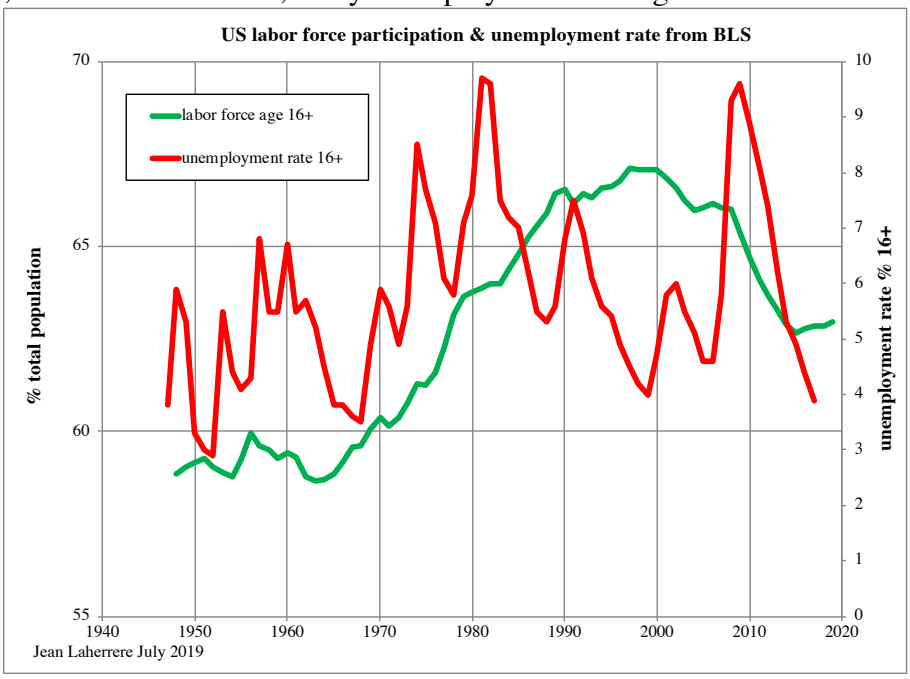


In 2018 France has the same percentage (72%) of labor force participation than the US, despite that the unemployment ratios are quite different 9% (France) against 4% (US).

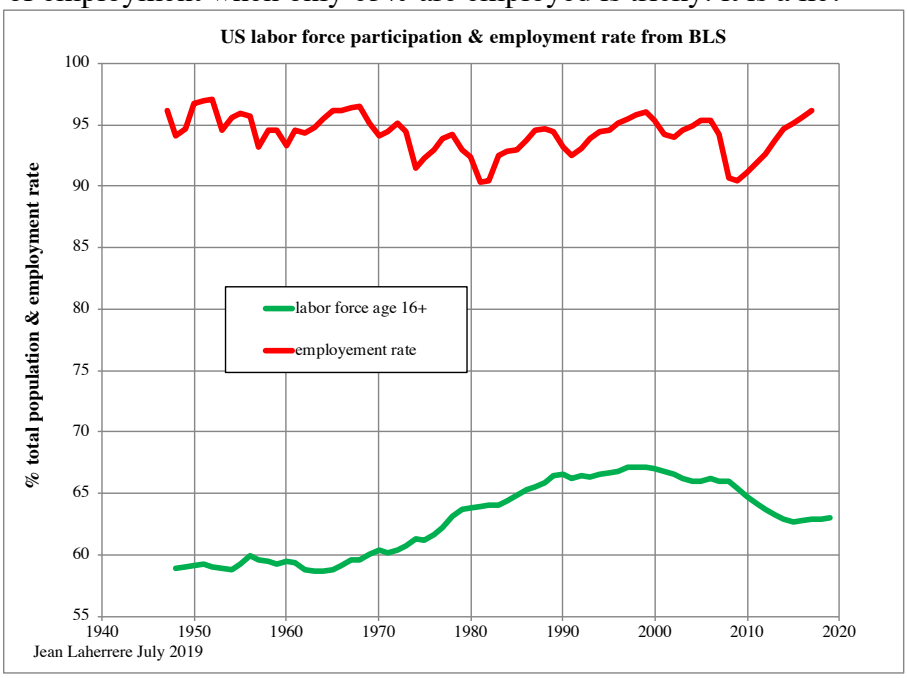
Data on % total population (16-64) from WB for the US labor force is higher than data from BLS (16 over)



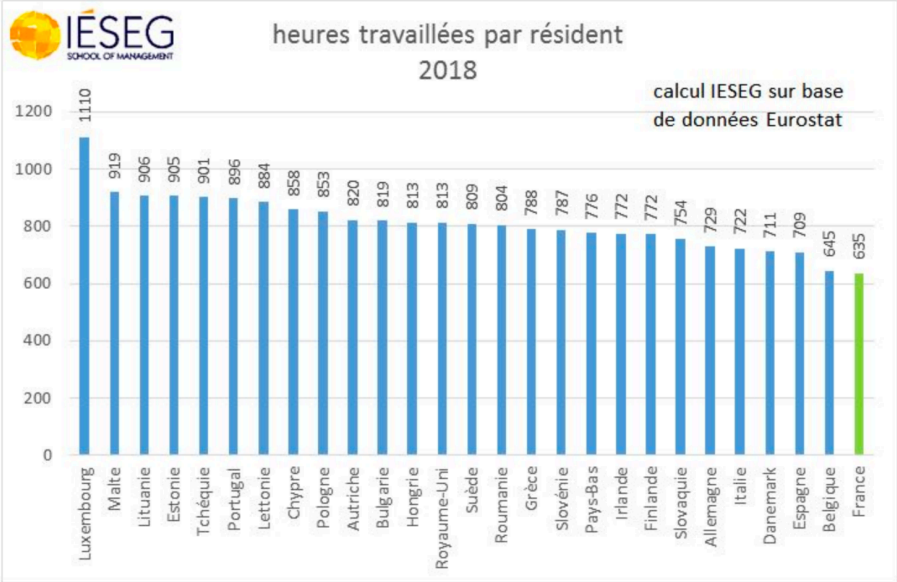
US unemployment rate (16 years over) from BLS differs widely with US labor force participation (16+), because, as mentioned before, many unemployed do not register.



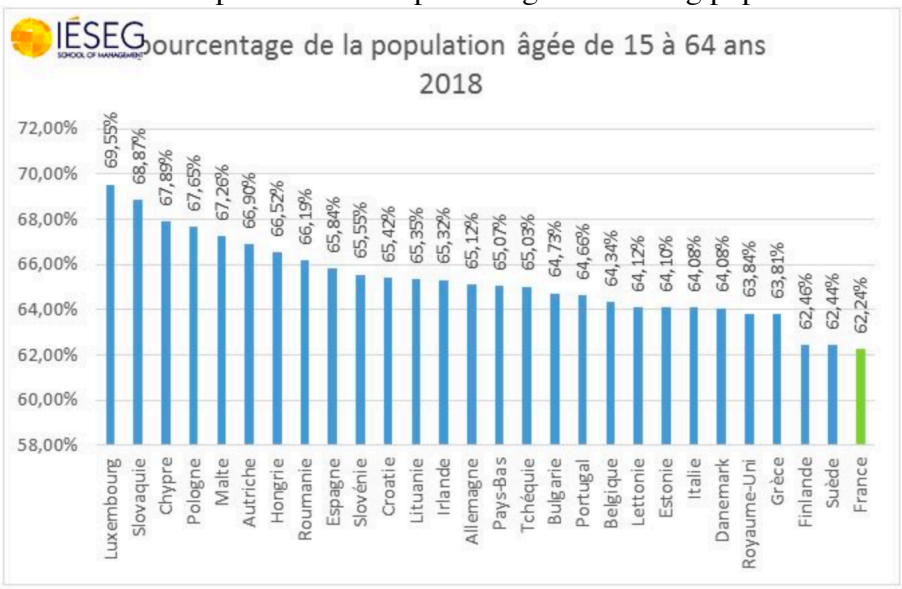
Claiming 96% of employment when only 63% are employed is tricky: it is a lie!



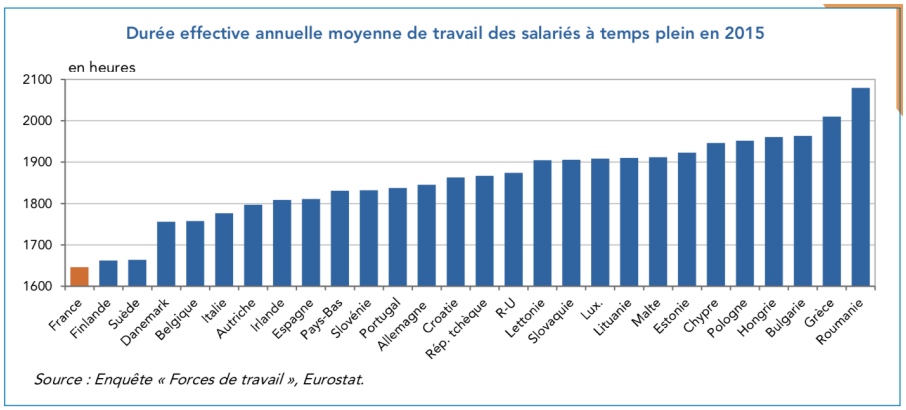
Employment ratio needs also to compare the working time.
France displays in 2018 the lowest value in Europe on average number of working hours per capita (Luxembourg the highest)



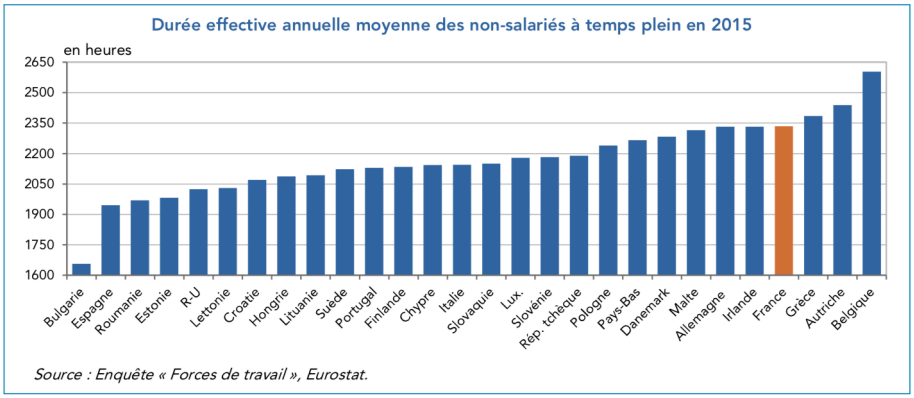
France has also in 2018 in Europe the smallest percentage of working population 15-64 years.



Eurostat in 2015 France displays the lowest number of hours for workers paid full time with 1640 hours



But self-employed Frenchmen work over 2300 hours in 2015, which is 40% more than the Frenchmen who work for a salary.
Such inequality is rarely mentioned in the French medias!
Equality is dear to Frenchmen when they are in the wrong side, hoping to gain, not in the contrary.



-Conclusion

Since many years in most of my papers I conclude that the problems of demography (in particular the huge increase of Africa population obliged to flood Europe) are more important than the problems of resources.
It seems that my past comments were not strong enough: I should shout more.
I do not know how to do to alert the world, the numbers are there, published by the UN 2019.
The immigration of Africans to Europe has just begun and it will increase for decades.
Today 45% of the world population has a fertility below 2.1 children per woman, meaning that they trend towards extinction, 20% is growing and will survive, 35% is uncertain (but likely to be extinct). The old division between developed and undeveloped countries is dying.
Few people realize that to day there are two kinds of population: those who will survive, those who will be extinct.
It means that in the future there will be a big change in the origin of the population.
UN forecast for decades is based on the utopia that developed low fertility countries will in the future increase fertility to reach replacement rate, or that in 2100 world birth rate will equal death rate by reason of right balance. UN wish that high fertility decreases and that low fertility increases, in fact they do no change much.
The example of Nigeria forecasted to reach a population of 790 M in 2100 when Europe will be at 640 M is a proof that these forecasts are unstainable, in fact impossible.
All UN forecasts on migration look unrealistic.
Something should happen to change it and I do not know what it would be.
Some believe that Gaia will take care of it.
Some believe that mankind should take care of it, but how?
Changing fertility is a long process and depends mainly of female education: but the Taliban's and Boko Haram attacking girls going to school disturb the utopia of the UN forecasts
People hope that the present situation is just a crisis which will cease soon, they are wrong.
The UN forecast is unreliable, as shown by the large variation of past forecasts.
The UN show that they are unable to estimate the uncertainty of their data.
The UN hide some fact, as the 1960 Great Famine in China.
It means that past population data is manipulated!
To get right forecasts, right past data are needed: it is not the present population situation: more census should be carried on in every country.

NB Sorry for my broken English