☑ Fact-Checked Science

PAPER CHECK · SPACE WEATHER AND HEALTH

Geomagnetic activity and births: the R = 0.75 reproduces, but a straight line scores the same

A 2026 preprint on SSRN groups the years of each solar cycle and finds that average geomagnetic activity and the world's birth rate a year later correlate at R = 0.75; it reads this as space weather driving more than half of the changes in births, and projects a rise for 2024–2027 [1 p. 1][1 p. 8]. S0 News linked it as "Geomagnetic Birth Rate" [2]. Rebuilt from public data, the R and the projections reproduce, but a straight falling line grouped the same way scores 0.755, because birth rates fell steadily after 1950 [3][5].

By Fact-Checked Science · Published October 30, 2026

OUR ANALYSIS marks our own reasoning and calculations, which here include the whole re-run, and the verdicts are our assessment. Of the preprint [1] we read the full text, a nine-page PDF the site's owner downloaded from SSRN, cited by page and table, and SSRN's listing as Crossref records it, cited as Listing. Of the episode [2] we could read only its title and description; no transcript was available. Everything else about the preprint's numbers is our re-analysis of the public data in the numbered sources.

The number is right, but it measures falling birth rates

OUR ASSESSMENT

0.7515
the preprint's R, rebuilt from public data: 12 averages drawn from 74 years of geomagnetic activity and world birth rates a year later, by our re-run [5][3]

0.755
the same calculation with a straight line falling 0.3 per 1,000 a year in place of the birth rate, by our re-run

4 in 10
synthetic birth rates with the world's own trend and year-to-year noise, but no solar signal, that reach 0.75 or more, by our re-run

THE CLAIMS

MISLEADING

Birth rate tracks Ap, R = 0.75

The preprint: "Overall, for 12 years of the average solar cycle (74 years of observations), the relationship turned out to be strong and direct, with a correlation coefficient of 0.75." [1 p. 1]

The number is right: the paper's method, applied to GFZ's Ap index, the UN's birth rates and SILSO's dates of solar minima, gives 0.7515, and 0.7518 with the paper's own Ap values [5][3] and [6]. But a straight falling line grouped the same way gives 0.755, and birth rates with the real trend and noise but no solar signal reach 0.75 four times in ten. With the trend removed, R drops to 0.19–0.45, and moving the record's first year moves it from −0.06 to +0.82, by our re-run. Our check of the author's mortality preprint rated "Mortality tracks Ap, R = 0.72" Misleading for the same reason. See section 4.

FALSE

Space weather explains over half

The preprint: "More than half of the changes in global birth rates over the past 70 years are strictly linked to space weather." [1 p. 8]

It rests on reading R^2 as a share explained: "An R^2 value of 0.5652 indicates that 56.52% of the total variability (variation) in the global average birth rate is explained by fluctuations in the geomagnetic Ap index." [1 p. 7] A straight falling line grouped the same way gives the same R^2, 0.57. Year by year, even with the trend left in, Ap goes with at most about 23% of the variation in the birth rate (r = 0.475, the shared decline), and once the trend is removed with none in the direction the paper claims (r = −0.02 to −0.34), by our re-run. The fall is what the UN calls the demographic transition [4 p. 1]; the Global Burden of Disease study finds that "Fertility rates declined in all countries and territories since 1950", and forecasts fertility from women's education, contraception, child mortality and population density [10 Abstract]. The paper's "the probability of a random coincidence is 0.48%" [1 p. 7] misreads a p-value computed on 12 trending averages: birth rates with the real trend and no solar signal reach R = 0.75 four times in ten. See section 5.

UNSUPPORTED

Birth rate rises again, 2024–27

The preprint: "The projected birth rate for 2024 is 16.916, for 2025 — 17.620, for 2026 — 17.259, and for 2027 — 17.501." [1 p. 1]

They come from "the established ratios of birth rates across the years of an average solar activity (SA) cycle" [1 p. 8], a formula that uses no Ap at all and builds in a rise. They sit above the UN's 95% prediction interval in every year [3]. Run from earlier years, the same formula did worse than assuming no change in 50 of 53 one-year tests; from the four starts since 1980 at the same point of the solar cycle, it projected 16 rises where the birth rate fell 15 times, by our re-run. The UN's world estimates for 2024–27 aren't out yet; its next revision is due on 11 July 2027 [18]. See section 6.

UNSUPPORTED

Geomagnetic birth rate

S0 News, its label on the link to the preprint's SSRN listing: "Geomagnetic Birth Rate" [2]

No evidence we could find shows geomagnetic activity setting the world's birth rate. The preprint's R is what a steadily falling series gives with no solar signal, year-by-year changes show no link, and the few peer-reviewed studies of solar activity and births are small, local and point different ways [11][13] and [14]. The episode's own words could not be checked: no transcript was available. See section 7.

1 · THE PREPRINT

A correlation of averages, posted on SSRN and not peer reviewed

Vladimir Belkin's preprint uses "a methodological approach based on the works of A. L. Chizhevsky": it numbers the years of each solar cycle, groups the years by number, and compares each group's average geomagnetic activity with the average world birth rate a year later, over 74 years [1 p. 1]. It was posted on SSRN in 2026, its record was deposited with Crossref on October 27, and it has not been peer reviewed [1].

What we read: the full text

We read the paper as a nine-page PDF, which the site's owner downloaded from SSRN in his browser on October 30, 2026; SSRN refuses our own tools, and shows browsers a "Verify you are human" check, which we don't attempt. We also read SSRN's listing of it, whose title and abstract Crossref records [1 Listing]. The paper gives its data in two tables and draws two figures, and states no caveats, funding, competing interests or licence. Crossref lists a CC BY-NC-ND 4.0 licence, so we quote the paper and redraw nothing from it [1]. Everything marked OUR ANALYSIS is our own re-analysis of public data.

In the paper's words

How it numbers the years, what it finds and what it makes of it, verbatim; CA and SA both stand for solar activity.

> *"The first year in the CA cycle is considered to be the first year of its growth, i.e., the growth of the Wolf number, which is presented in column 2. Subsequent years are numbered in order, and the last year in the cycle is considered to be the year of the CA minimum."*
>
> Belkin (2026) [1 pp. 1–2]

> *"Overall, for 12 years of the average solar cycle (74 years of observations), the relationship turned out to be strong and direct, with a correlation coefficient of 0.75."*
>
> Belkin (2026) [1 p. 1]

> *"More than half of the changes in global birth rates over the past 70 years are strictly linked to space weather."*
>
> Belkin (2026) [1 p. 8]

The data it uses

Its Table 1 lists, for each year from 1949 to 2025, the yearly sunspot (Wolf) number from SILSO, the year's number in its solar cycle, the yearly Ap index from GFZ, which measures how disturbed Earth's magnetic field is, and the world's birth rate from Our World in Data, also shifted a year to give the lag [1 Table 1][1 pp. 1–2]. Our World in Data's "Birth rate" is the UN's World Population Prospects 2024 to the third decimal [7][3]. The abstract adds that "The latest up-to-date UN database contains accurate calculated data on the total birth rate only up to and including 2023" [1 p. 1]. The estimates do end in 2023, but for that year only 35 countries and areas had data on fertility by age, and six more had counts of births [4 p. 52]: for most countries the 2023 figure is modelled.

Its author's other postings

The author's public ORCID record lists 41 postings on SSRN since 2020 and a 2014 journal article. Nearly all the postings relate solar or geomagnetic activity to economic series, among them world GDP, the price of gold and the U.S. Federal Reserve's rate. The record added one on world death rates on October 21 and one on world population growth on October 30 [9]; with this one, deposited on October 27 and not yet on the record [1], three of his postings in ten days concern population. We checked the first: Geomagnetic activity and deaths.

2 · THE MEASURE

SSRN's listing says "fertility"; the paper measures the crude birth rate

SSRN's listing, the page S0 News linked, calls the series the "Global Fertility Rate" and the "total fertility rate" [1 Listing]. The paper itself calls it the "birth rate" and, in its abstract and keywords, the "total birth rate", defined as "the number of births per 1,000 people on Earth" [1 p. 1], and in its forecast the "crude birth rate" [1 p. 8]; the word "fertility" isn't in it. SSRN's listing carries the same abstract with "total fertility rate" where the PDF has "total birth rate" [1 Listing]. The UN publishes births per 1,000 people and births per woman as two different measures [4 p. 5][4 p. 9].

CRUDE BIRTH RATE, 2023

16.3
births per 1,000 people, world, in the UN's estimates [3]

TOTAL FERTILITY RATE, 2023

2.25
births per woman over a lifetime, at that year's rates [3][4 p. 9]

R, EITHER MEASURE

OUR ANALYSIS

0.75
0.7515 for the crude birth rate and 0.746 for the total fertility rate, grouped the paper's way

The UN's definitions

"The crude birth (or death) rate is the annual number of live births (or deaths) divided by the mid-year population size. Both rates are expressed as the number of births or deaths per 1,000 population per year" [4 p. 5]. The fertility level is "the average number of live births per woman over a lifetime," and "Currently, the global fertility rate stands at 2.25 live births per woman" [4 p. 9], "down from 3.31 births in 1990" [4 p. VIII]. The World Bank keeps the two apart in the same way, as "Birth rate, crude (per 1,000 people)" and "Fertility rate, total (births per woman)" [8].

OUR ANALYSIS

One series, two names

The paper's birth rates are the UN's crude birth rates, through Our World in Data, in all 74 years of its Table 1 [1 Table 1][3], and its projections, 16.9 to 17.6 per 1,000, are on that scale [1 p. 1]. The total fertility rate would have given almost the same R, 0.746, because it fell steadily too. So the paper describes its measure correctly, as births per 1,000 people, if not always by its standard name; SSRN's listing, which is what the episode's link opens, gives it the name of the other measure, which counts births per woman.

3 · THE RE-RUN

Rebuilt from public data, the paper's numbers come out the same

We rebuilt the calculation from GFZ's Ap index, the UN's world birth rates and the dates of solar minima from SILSO, the sunspot-number data center at the Royal Observatory of Belgium [5][3] and [6], with the code of our check of the author's mortality preprint. We first worked out the method from the abstract alone; the full text confirms every step, and its two tables match ours [1 Table 1][1 Table 2].

STEP 1

Activity

Average GFZ's daily Ap index over each year from 1949 to 2022 [5]. The paper's yearly values differ from ours by up to 0.13 [1 Table 1].

STEP 2

Births

Take the UN's world crude birth rate a year later, 1950 to 2023, as the paper's Table 1 does [3][1 Table 1].

STEP 3

Number the years

Year 1 is the first year the sunspot number grows again, and the minimum year is a cycle's last [1 pp. 1–2]: the years after SILSO's minima of 1944, 1954, 1964, 1976, 1986, 1996, 2008 and 2019 [6]. So 1955 is year 1 of cycle 19, and its group gets the birth rate of 1956.

STEP 4

Average and correlate

Average each year number's Ap and birth rate, as the paper's Table 2 does, and correlate the 12 averages [1 Table 2].

R, YEARS 1–12

OUR ANALYSIS

0.7515
Pearson r across 12 averages of 74 years, with our yearly Ap; the paper's own Ap gives it 0.7518 [1 p. 8]. Textbook p = 0.0048, as in its Table 2 [1 Table 2].

ITS TABLE 1

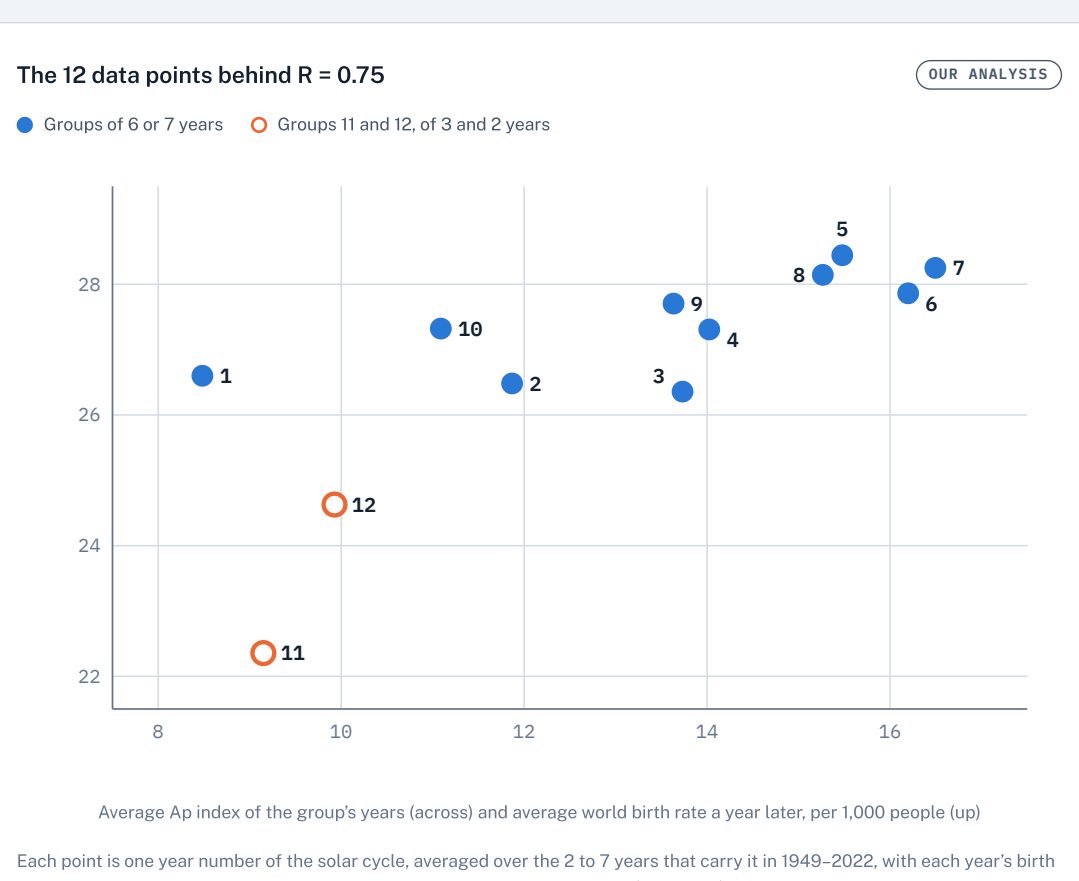
OUR ANALYSIS

77 of 77
years numbered as we number them; its birth rates equal the UN's in all 74 years with data [1 Table 1][3]

ITS TABLE 2

OUR ANALYSIS

12 of 12
averages of the birth rate equal ours to the second decimal; its averages of Ap are within 0.03 of ours [1 Table 2]



The 12 data points behind R = 0.75

OUR ANALYSIS

Each point is one year number of the solar cycle, averaged over the 2 to 7 years that carry it in 1949–2022, with each year's birth rate taken a year later. Across all 12, r = 0.75. Our analysis of GFZ's Ap index (CC BY 4.0) and the UN's World Population Prospects 2024 (CC BY 3.0 IGO), with the years numbered from SILSO's dates of solar minima [5][3] and [6]; the paper's own chart of these numbers is not reproduced [1 p. 8].

OUR ANALYSIS

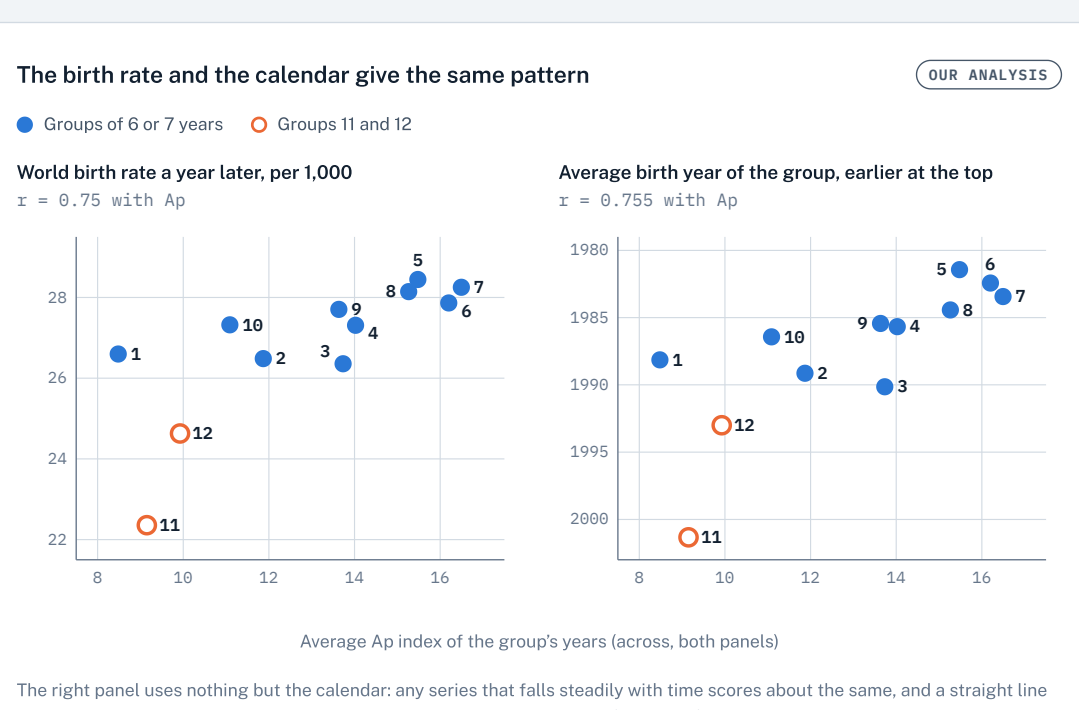
Points, not years

The paper reads its p = 0.0048 as meaning that "the probability of a random coincidence is 0.48%" [1 p. 7]. That isn't what a p-value measures, and this one assumes 12 independent points. The R rests on 12 averages, not 74 years, two of which hold only 3 and 2 years, and every average is drawn from the same steadily falling series, as the next section shows. Tested against birth rates that keep that fall, the chance comes out near 0.4, not 0.0048 (section 5).

4 · WHY

A straight line gives the same answer

The world's birth rate fell from 36.8 per 1,000 in 1950 to 16.3 in 2023 [3]. Group the years the paper's way, and each group's average mostly records how early its years are.



The birth rate and the calendar give the same pattern

OUR ANALYSIS

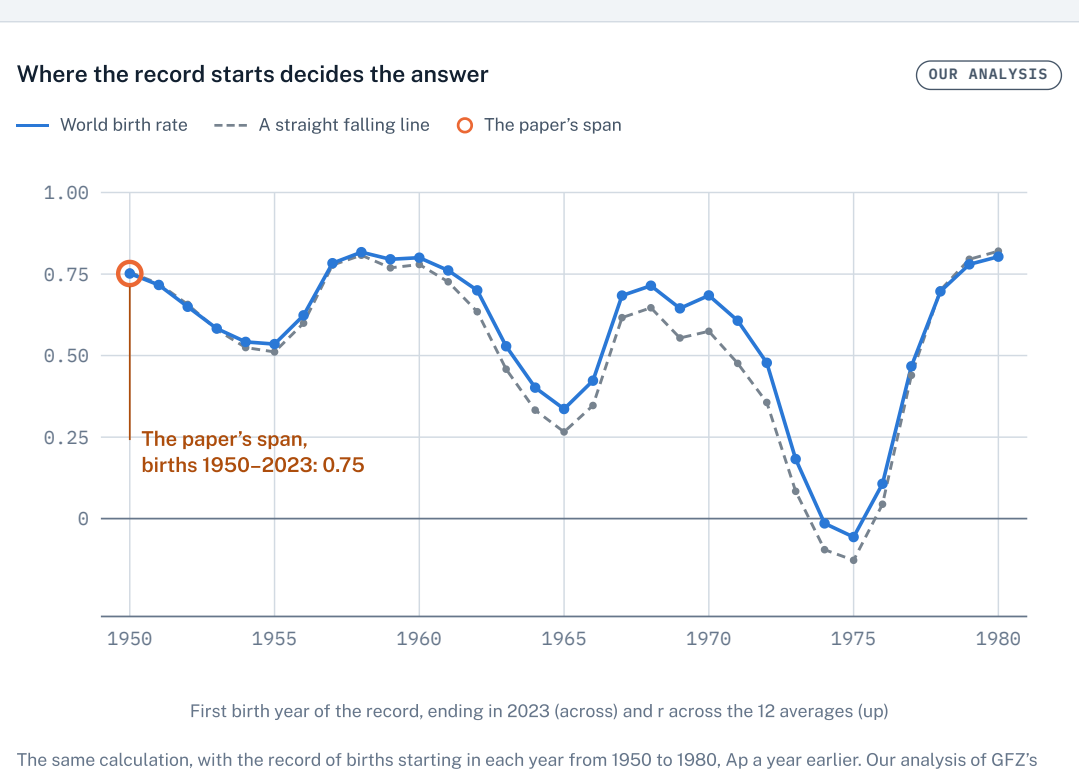
The right panel uses nothing but the calendar: any series that falls steadily with time scores about the same, and a straight line dropping 0.3 per 1,000 a year gives 0.755. Our analysis of GFZ's Ap index (CC BY 4.0) and the UN's World Population Prospects 2024 (CC BY 3.0 IGO), with the years numbered from SILSO's dates [5][3] and [6].

OUR ANALYSIS

How the groups line up

The paper's record of Ap starts in 1949, which is year 5 of cycle 18 [1 Table 1]. So groups 5 to 10 each get one of the years 1949–54, whose births, in 1950–55, ran at 36.5–37.7 per 1,000, and groups 1 to 3 each get one of the years 2020–22, whose births, in 2021–23, ran at 16.3–16.8 [3]. Group 4 gets neither. Groups 11 and 12 hold only five late years of the three longest cycles: births in 1976, 2008 and 2020, and in 1977 and 2009. The groups' average birth years run from 1981 for group 5 to 2001 for group 11.

Geomagnetic activity peaks in groups 5 to 8 and is lowest in groups 1, 11 and 12 [5]. So the early groups, with high birth rates, are also the active ones, and the correlation across all 12 comes out at 0.75, as the calendar alone gives 0.755.



Where the record starts decides the answer

OUR ANALYSIS

The same calculation, with the record of births starting in each year from 1950 to 1980, Ap a year earlier. Our analysis of GFZ's Ap index (CC BY 4.0) and the UN's World Population Prospects 2024 (CC BY 3.0 IGO), with the years numbered from SILSO's dates [5][3] and [6].

OUR ANALYSIS

Starting the record in any year from 1950 to 1980 moves the R from −0.06 to +0.82. A straight line moves in step, from −0.13 to +0.82: across the 31 start years the two curves correlate at 0.990. Ending it in any year from 1993 to 2023 instead moves it from −0.11 to +0.77, with the line again in step (0.973). The record's ends, not the births, set the number.

OUR ANALYSIS

Not age structure

The crude birth rate depends on how many people are of childbearing age. The total fertility rate doesn't, and it gives the same answer, 0.746, because it fell steadily too, from 4.85 births per woman in 1950 to 2.25 in 2023 [3]. The decline is what the UN calls the shift of all populations "towards longer lives and smaller families, a process known as the 'demographic transition'" [4 p. 1].

OUR ANALYSIS

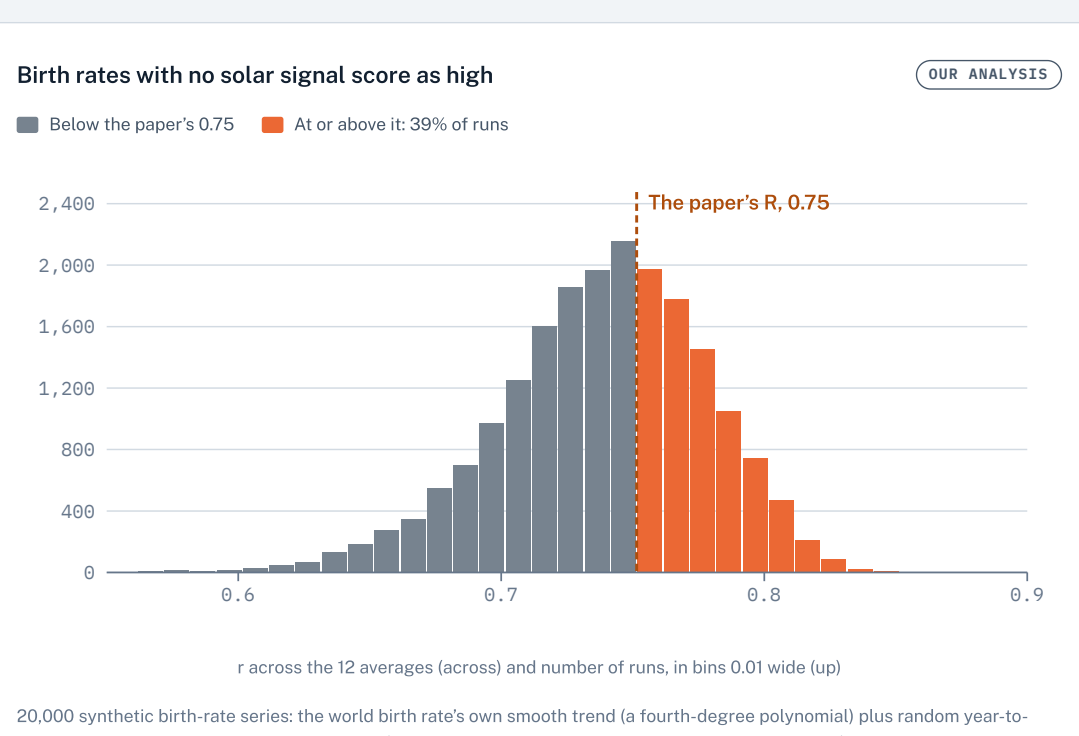
What the trend leaves over: a famine

China's famine, which Ashton and colleagues date to 1958–61 [17], cut its birth rate from 37.7 per 1,000 in 1958 to 25.7 in 1961 in the UN's estimates, before a rebound to 48.9 in 1963; the world's fell from 35.9 to 32.9, then rose to 37.5 [3]. Those births pair with Ap in 1958–62, at and after the peak of cycle 19, and 1960 has the highest yearly Ap of 1949–2025, 23.7 [5]. Without the famine's births of 1959–61 the R is 0.70; without the rebound of 1962–63 as well, 0.56 (p = 0.06).

5 · THE TESTS

Birth rates with no solar signal score as high, and the years one by one show no link

The paper tests its R only against the textbook p-value [1 Table 2]. We ran the checks a correlation like this needs: compare it with birth rates that carry no solar signal, remove the trend, leave out shocks that have nothing to do with the Sun, change the choices the method leaves open, and look at the years one by one.



Birth rates with no solar signal score as high

OUR ANALYSIS

20,000 synthetic birth-rate series: the world birth rate's own smooth trend (a fourth-degree polynomial) plus random year-to-year noise like its departures from that trend (lag-1 correlation 0.72, standard deviation 0.84 per 1,000), with the real Ap and the real numbering of the years. Our analysis [5][3] and [6].

39%
of these runs reach the paper's 0.75 or more; 39–42% across our four versions, two of which resample the real departures, famine included

0.74
their median: what the trend alone delivers

0.67–0.80
the middle 90% of these runs

OUR ANALYSIS

What R^2 = 0.57 does and doesn't mean

The paper takes R^2 = 0.5652 to mean that "56.52% of the total variability (variation) in the global average birth rate is explained by fluctuations in the geomagnetic Ap index" [1 p. 7], and adds that "All other factors combined — such as global economic crises, wars, urbanization, advancements in medicine, the use of contraception, and state demographic policies — account for less than half, specifically 43.48%" [1 p. 8].

The R^2 describes 12 averages, not the birth rate's 74 years, and the calendar "explains" 57% of them in exactly the same way. Year by year, even with the trend left in, Ap goes with at most about 23% of the variation in the birth rate (r = 0.475, the shared decline). Once the trend is removed, it goes with at most about a tenth, in the opposite direction; with at most 7%, still in the opposite direction, once the famine years are left out; and with next to none with the more flexible trends (below). The fall itself is the one the UN ascribes to the demographic transition [4 p. 1], which the Global Burden of Disease study finds in every country and forecasts from women's education, contraception, child mortality and population density [10 Abstract].

The same method, other choices

OUR ANALYSIS

VARIANT	R ACROSS THE 12 AVERAGES	A STRAIGHT LINE, SAME YEARS
As published: birth rate 1950–2023, Ap a year earlier	**0.75**	**0.755**
Total fertility rate instead	0.746	–
Without the famine's births, 1959–61	0.70	–
Without 1959–63, famine and rebound	0.56	–
Without births in 2021–23 (cycle 25) / 1950–55 (cycle 18)	0.63 / 0.62	–
Complete cycles only, births 1956–2020	0.44	0.40
Births 1970–2023	0.68	0.57
First half / second half, births 1950–86 / 1987–2023	0.26 / 0.40	0.28 / 0.53
Birth rate minus its smooth trend (polynomial, degree 2–4)	0.19 to 0.45	–
The same, with 1959–63 interpolated in the trend and left out of the correlation	0.68	–
Year-to-year changes in both Ap and the birth rate	0.31	–
The same, without the changes into and out of 1959–63	0.61	–
The minimum year itself as year 1	0.57	0.58
The minimum year as year 1 only if the minimum falls in January–June	0.75	0.76

Our re-run [5][3] and [6]. A Hodrick–Prescott trend gives 0.26 and 0.34 in place of the polynomials. Textbook p-values for the detrended values are 0.15–0.55.

OUR ANALYSIS

What is left after the trend

With the trend removed, R falls to 0.19–0.45; the highest of these, 0.45, trend-free noise like the birth rate's own departures from its trend reaches in about a fifth of runs (21–22% of 40,000). Two of our variants, both leaving out the famine and rebound years 1959–63, keep more: 0.68 for the detrended birth rate, which such noise reaches in 3–8% of runs, and 0.61 for year-to-year changes in both, which reshuffled changes reach in 1.5%.

The 0.68 holds at lags of 0 and 2 years (0.43–0.59), under the minimum-year numbering (0.52–0.58) and in complete cycles (0.74–0.78). But it rests partly on the two thin groups, 11 and 12, five birth years in all (about 0.5 without them), reverses for births since 1987 (−0.24 to −0.35) and vanishes with the January–June numbering (−0.21 to 0.00). The 0.61 for changes holds in complete cycles (0.69) but vanishes at lags of 0 and 2 years (−0.21, 0.08). Neither has a counterpart year by year: the same detrended values correlate at −0.02 to −0.08, and the changes at 0.08 (p = 0.51). So what is left is a grouped residual that some choices remove and that the yearly data don't show, found among dozens of variants we tried. It doesn't rescue R = 0.75, and it doesn't support "more than half".

We also shuffled whole solar cycles, and shifted the solar record in time against the birth rates, as tests of solar–terrestrial claims often do. Both rate even a straight line as unusual here (p = 0.007 and 0.014 for the line, against 0.016 and 0.04 for the birth rate), because moving the cycles changes which years fall in each group, so they can't separate a link from the trend, and we don't use them as evidence.

Year by year, and other lags

OUR ANALYSIS

No averaging, no link

Without any averaging, Ap and the next year's birth rate correlate at 0.475 over 74 years, because both series were lower in recent decades [5][3]. Both series change slowly, which leaves about 14 independent points and p = 0.09 [16]. With the trend removed the sign turns, r = −0.22 to −0.34, mostly from the famine's missing births at the peak of cycle 19; without 1959–63 it is −0.02 to −0.27, and −0.02 to −0.08 with the more flexible trends (p ≥ 0.5). Year-to-year changes in both give −0.16 (73 years, p = 0.18), and 0.08 without the changes into and out of the famine years (67 years, p = 0.51).

OUR ANALYSIS

The lag is a free choice

The paper pairs each year's Ap with the next year's births [1 Table 1]. Other lags score as high or higher, and a straight line follows them almost exactly. Negative lags pair births with a later year's Ap, which can't be an effect, and still score 0.31 and 0.51.

LAG, YEARS	BIRTH RATE	STRAIGHT LI
−2	0.31	0.32
−1	0.51	0.55
0	0.66	0.69
+1	**0.75**	**0.76**
+2	0.78	0.78
+3	0.77	0.77
+4	0.66	0.64
+5	0.43	0.38

6 · THE PROJECTIONS

A rise built into the method, above the UN's range in every year

The paper projects the world's birth rate at 16.916 per 1,000 for 2024, 17.620 for 2025, 17.259 for 2026 and 17.501 for 2027 [1 p. 1], up from 16.33 in 2023 [3]. Its method: "Forecasting can be performed based on the established ratios of birth rates across the years of an average solar activity (SA) cycle (see column 6 of Table 2)." [1 p. 8]

The projections, rebuilt and set beside the UN's

OUR ANALYSIS

YEAR	ITS AP YEAR, YEAR OF CYCLE	OUR REBUILD	THE PAPER	UN, MEDIUM	UN, 95% INTERVAL	BIRTHS IMPLIED, AGAINST THE UN'S
2024	2023, year 4	16.917	16.916	16.22	15.57–16.88	138.1 against 132.4
2025	2024, year 5	17.620	17.620	16.08	15.35–16.82	145.0 against 132.4
2026	2025, year 6	17.259	17.259	15.96	15.17–16.72	143.3 against 132.5
2027	2026, year 7	17.501	17.501	15.84	14.99–16.62	146.5 against 132.6

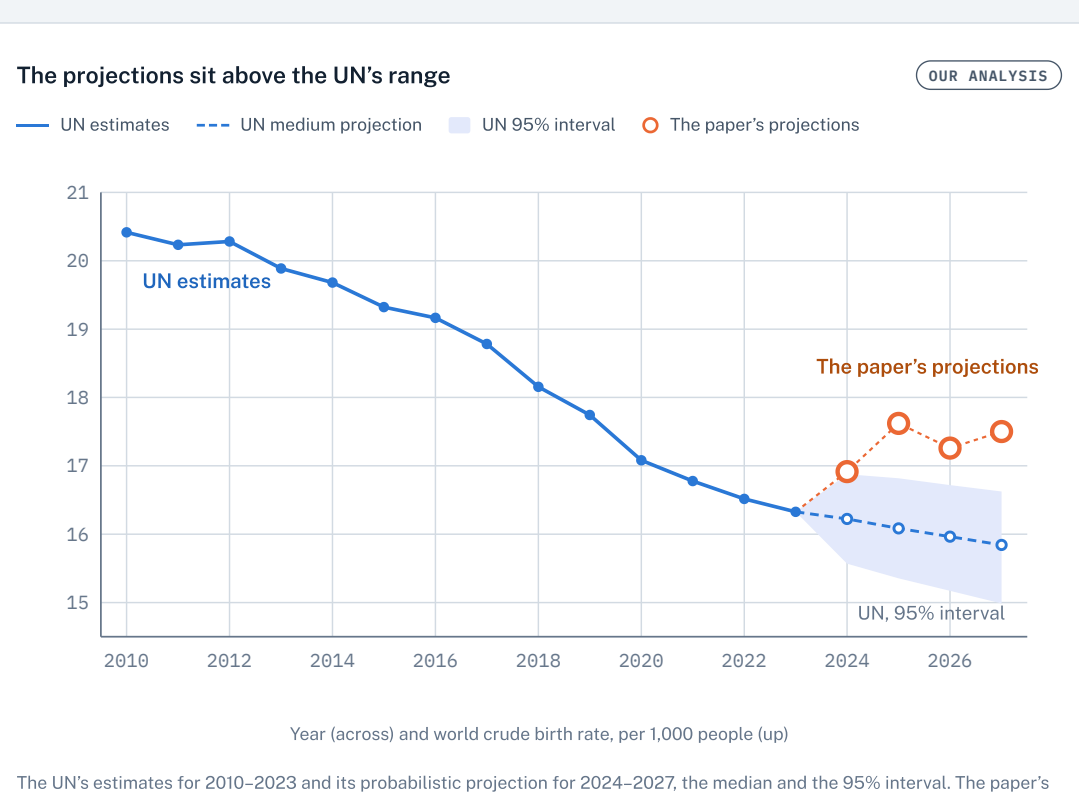
Birth rates per 1,000 people; births in millions, from the UN's projected population. Our re-run [5][3] and [6], from the unrounded averages; the paper's values from its abstract [1 p. 1]; the UN's medium projection and 95% prediction interval from World Population Prospects 2024 [3].

OUR ANALYSIS

A rise built in

For 2024, the paper takes the ratio of two of its 12 averages, "1.036 (note the 1-year lag)", and finds "the projected crude birth rate for 2024 is 1.036 × 16.327 = 16.916"; the later years follow by the ratios in turn [1 p. 8]. We had found the same formula from the abstract alone. With the ratios taken to four decimals, it gives all four of the paper's projections exactly; its Table 2 prints them to three [1 Table 2].

The formula uses no Ap at all, only the year numbers. Ap rose from 11.7 in 2024 to 15.5 in 2025, the highest yearly average since 2003 [5], yet the projection for 2026 is lower than for 2025. The rise comes from which years the averages hold: year 3's average includes 2023, the latest and lowest birth rate, while year 4's has no year of the present cycle yet, and years 5–7 each hold one of the high birth rates of 1950–52. Take the trend out of the averages and the same steps between them become −0.35, −0.31, −0.64 and +0.01 per 1,000, instead of +0.95 to +2.09. In a steadily falling series the formula projects a rise almost every time. Nor do the 12 averages describe any real year: the straight line through them would put 2023's birth rate at 25.4 per 1,000.



The projections sit above the UN's range

OUR ANALYSIS

The UN's estimates for 2010–2023 and its probabilistic projection for 2024–2027, the median and the 95% interval. The paper's values lie above the interval in every year, by 0.04 per 1,000 in 2024 and 0.54–0.88 in 2025–27. Our chart of the UN's World Population Prospects 2024 (CC BY 3.0 IGO) [3] and of the paper's numbers [1 p. 1].

The same formula, from the same point in earlier cycles

OUR ANALYSIS

FROM	BIRTH RATE THEN	PROJECTED CHANGE, 1 TO 4 YEARS ON	WHAT HAPPENED
1968	34.36	−0.75, +0.23, −0.44, +1.59	−0.59, −0.77, −1.54, −2.23
1980	28.66	+0.95, +1.57, +0.94, +1.95	−0.01, +0.22, −0.56, −0.56
1990	26.93	+0.68, +1.58, +0.95, +1.69	−1.40, −2.12, −2.67, −3.12
2000	22.00	+0.75, +1.51, +0.99, +1.44	−0.35, −0.63, −0.86, −0.99
2012	20.28	+0.55, +1.36, +0.91, +1.26	−0.39, −0.60, −0.96, −1.12
2023, the paper	**16.33**	**+0.59, +1.29, +0.93, +1.17**	**Not yet known**

Changes in births per 1,000 over the starting year, when the Ap year before it was year 3 of its cycle, as 2022 is. Each row uses only the years up to then, so the 1968 row rests on averages of one or two years. From the four starts since 1980 the formula projected 16 rises; the birth rate fell in 15 of those years. Our re-run [3][5] and [6].

OUR ANALYSIS

Tested on the years that have data

Run from every year from 1965 to 2019, with only the years up to then, the formula did worse than simply assuming no change in 50 of 53 one-year projections: its average miss was 1.67 per 1,000, against 0.37, and four years ahead 2.34 against 1.25. It projected a rise 50 times; the birth rate rose 8 times. Of 165 projected rises of 0.5 per 1,000 or more, one came true. The world's birth rate hasn't risen that much in any year since 1968, and has fallen every year since 2012 [3].

OUR ANALYSIS

Where the world's data stand

The UN's estimates end in 2023, and its next revision is due on 11 July 2027 [18], so the projections can't yet be scored against world data. The UN projects a continued fall, to 15.8 per 1,000 in 2027; the paper's values are above its 95% interval in every year, and above its projection with every country's fertility held at the 2023 level, 16.4–16.5 [3]. They would take 4.5% more births in 2024 than in 2023, and 8–11% more in 2025–27, some 6 to 14 million a year more than the UN projects: about 2.34–2.47 births per woman, against 2.25 in 2023, by our arithmetic on the UN's variants. The World Bank's figure for 2024, which combines the UN's projections with national statistics, is 16.27 [8].

7 · THE EPISODE

"Geomagnetic Birth Rate": a label for a trend

S0 News linked the preprint's SSRN listing in the episode's description under the label "Geomagnetic Birth Rate" [2]. No transcript was available, so the episode's own words about it could not be checked.

OUR ANALYSIS

What the label says, and what the evidence shows

The label presents the preprint as showing that the world's birth rate follows geomagnetic activity, as the paper itself claims [1 p. 8]. No evidence we could find shows that. The paper's R is what a steadily falling series gives with no solar signal at all; year by year, changes show no link; and what is left after the trend is a grouped residual that some choices remove and that the yearly data don't show (section 5). The few peer-reviewed studies of solar activity and births are small and local and point different ways (section 8). We rate the label Unsupported.

The rest of the episode

The episode's title, "Shift in the Sky, Coronal Hole Coming, Cosmic Cat", ties none of its phrases to this preprint, so we rate none of them here [2]. The paper says nothing about Earth's main field, its poles or the equator [1]. The episode's link labelled "Magnetic Pole Shift Equator" goes to a paper on the equatorial electrojet, checked on our page on that paper.

8 · THE WIDER EVIDENCE

A few small studies, pointing different ways

We found a handful of peer-reviewed studies of solar activity and births, mostly older and local, which we read in abstract only. None that we found shows the world's birth rate following geomagnetic activity.

Births and the 11-year cycle

Walter Randall found a period of about 11 years in yearly U.S. and New Zealand births, 1909–1985, with periodograms and periodic regression, and related it to the sunspot cycle [12]. With Walter Moos he then folded the yearly births of seven countries and regions, 1930–1984, into 11-year cycles, much as the preprint does, and found the cycle-year averages correlated with sunspots, solar flares, geomagnetic indices and temperature [11]. Their abstracts don't say whether the long-term trends were removed.

Daily births in Germany

In daily births from German social-security records, 1920–1989, the Moon had no effect, and births were positively associated with the day's number of sunspots, an influence the authors suggest medical progress made less important over time [13].

Twins in Siberia

In the Novosibirsk region, 1957–2008, twin and other multiple births were less frequent at the peaks of the solar cycle than at its troughs, 7.36 against 8.10 per 1,000 births, and correlated with the sunspot number a year earlier at r = −0.60. The author proposes early pregnancy loss as a hypothesis [14].

Born at solar maximum

In records of 8,662 people born in Norway in 1676–1878, those born in years of high solar activity were less likely to survive to adulthood, and low-status women born then had fewer children over their lives: an effect on the people born, not on the year's birth rate [15].

Why birth rates fell

The Global Burden of Disease study's fertility analysis found that "During the period from 1950 to 2021, global TFR more than halved, from 4·84 (95% UI 4·63-5·06) to 2·23 (2·09-2·38)", and that "Fertility rates declined in all countries and territories since 1950". Its forecasts rest on women's education, the use of contraception, child mortality and population density, not on the Sun [10 Abstract].

On this site

Our check of the author's mortality preprint found the same pattern for world death rates, with the same method: Geomagnetic activity and deaths. Our check of a video's claim that solar cycles can be tied to crime, wars and revolutions, the tradition of Chizhevsky that the preprint follows, rated it Unsupported: The Sun and wars, crime and revolutions.

9 · LIMITS

What this check can't tell us

No tests in the paper to compare

The paper reports a correlation and a textbook p-value; it doesn't remove the trend, allow for the averages' dependence on one another, or discuss the fall in the birth rate, so there were no tests of its own to set beside ours [1].

Its yearly Ap

The paper's yearly Ap values differ from our averages of GFZ's daily index by up to 0.13, perhaps from a different averaging; they move R only in the fourth decimal, 0.7518 against 0.7515 [1 Table 1][5].

Modelled birth rates

For 2023 the UN had data on fertility by age for 35 countries and areas, and counts of births for six more [4 p. 52], so its world estimate, like the paper's "accurate calculated data" [1 p. 1], is largely modelled. Year-by-year tests on such series can't detect small effects, for or against.

Yearly, worldwide averages

An effect on conceptions lasting weeks, or confined to some places, wouldn't show in yearly world totals; the paper's method couldn't detect one either.

Projections not yet testable

Until the UN's next revision, due on 11 July 2027 [18], the paper's projections can be set only beside the UN's own projections and the formula's record on earlier years [3].

One preprint

We checked this preprint's method, not the whole literature on solar activity and human reproduction, and we made no exhaustive search of it.

What would change these verdicts

01
An analysis that removes the trend, or tests the correlation against a null that keeps the trend, and still finds it clearly; the paper does neither.

02
The UN's world estimates for 2024 and 2025, due with its next revision on 11 July 2027 [18], showing the birth rate rising toward the paper's 16.9 and 17.6 rather than continuing to fall. We will check them then.

03
A link that survives removing the trend, in monthly births across many countries, with the analysis fixed before the data are seen.

These follow the rules of our out-of-sample test of a solar–earthquake claim: freeze the method before scoring, test against a null that keeps the data's trends, and hold back data.

10 · CODE AND NUMBERS

The script and the numbers

Every number on this page that is ours comes from one script, run on the public data.

PY **rerun.py**
The whole re-run: the numbering, the 12 averages, the check of the paper's Tables 1 and 2, the straight-line comparison, the variants, the start-year and lag scans, the year-by-year tests, the tests against synthetic birth rates and trend-free noise, the rebuilt projections, the UN's intervals and the hindcasts · 61 KB

CSV **annual_series.csv**
Each birth year, 1950–2023: the Ap of the year before and its number in its cycle, the world's birth rate, total fertility rate, births and population, and China's birth rate · 5 KB [5][3]

CSV **cycle_year_groups.csv**
The 12 averages behind the charts in sections 3 and 4 · 1 KB [5][3]

CSV **projections.csv**
The four projections: our rebuild, the paper's values, the UN's medium projection, 95% interval and constant-fertility and high variants, and the births implied · 1 KB [3]

CSV **hindcast.csv**
The formula run from every base year 1965–2019, one to four years ahead, beside "no change", a 10-year straight line and the UN's estimates · 9 KB [3]

CSV **null_summary.csv**
The share of runs reaching the observed value, and the percentiles, for every null test on this page · 2 KB

Run it

It needs only Python 3. Make a folder with three subfolders and save into them: `gfz-kp/` GFZ's Kp_ap_Ap_SN_F107_since_1932.txt [5]; `silso/` SILSO's TableCyclesMiMa.txt [6]; and `un-wpp2024/` the UN's demographic indicators, 17 MB, and, for the prediction intervals, its other variants, 75 MB, under their own file names [3]. Then run `python3 -I rerun.py <folder>`. It prints every number of ours on this page in under a minute; add a second folder name to have it write the CSV files too. To check the paper's tables as well, save the text of its PDF, made with `pdftotext -enc UTF-8 -layout`, as `paper/belkin2026-ssrn-7661578.txt`. Two more optional checks are skipped if their files are absent: `owid/crude-birth-rate.csv`, Our World in Data's copy of the series [7], and `worldbank/SP.DYN.CBRT.IN_WLD.json`, the World Bank's [8]. GFZ updates its file daily, so a fresh download can differ slightly in the latest days.

Related checks

UNSUPPORTED The Sun and wars, crime and revolutions The Disaster Cycle, Fact-Checked

Sources

Bracketed numbers refer to this list. For the preprint [1], p. gives a page of its nine-page PDF and Table a table; Listing means SSRN's listing of it, whose title and abstract Crossref records. For the episode [2] no transcript was available: we read its title and the links and labels in its description, and quote nothing else of it. For the other sources, p. gives a page of the cited work (for the UN's Summary of Results [4], its printed page) and Abstract its abstract; where only an abstract or a record was read, the entry says so. Links checked October 30, 2026.

1 Belkin, V. A. (2026). Birth Rate (1950–2023) and Geomagnetic Ap Index (1949–2022): R = 0.75. SSRN preprint, listed by SSRN as "Global Fertility Rate (1950-2023) and Geomagnetic Ap Index (1949-2022): R = 0.75" (listing), with its record deposited with Crossref on October 27, 2026; not peer reviewed. The PDF states no licence; Crossref lists CC BY-NC-ND 4.0. Read in full: the nine-page PDF, which the site's owner downloaded from SSRN in his browser and supplied on October 30, 2026, since SSRN refuses our tools and shows browsers a bot check that we do not attempt; and SSRN's listing, through the title and abstract that Crossref records.

2 SpaceWeatherNews (S0) (October 30, 2026). Shift in the Sky, Coronal Hole Coming, Cosmic Cat | S0 News Oct.30.2026. YouTube video, https://www.youtube.com/watch?v=T264iUQw8Rw, published at 11:35 UT. No transcript was available when this page was made, so we read only its title and the four links in its description, with their labels, as our collector recorded them, and could not quote the episode's own words. "Geomagnetic Birth Rate" is the episode's label on its link to the preprint's SSRN listing; its link labelled "Magnetic Pole Shift Equator" is checked on our page on the equatorial electrojet.

3 United Nations, Department of Economic and Social Affairs, Population Division (2024). World Population Prospects 2024, Online Edition: demographic indicators for the world (crude birth rate, total fertility rate, births and population), as estimates for 1950–2023 and as the medium projection, other variants and 80% and 95% prediction intervals for later years, CSV files read October 30, 2026. Made available under CC BY 3.0 IGO, as its download page states.

4 United Nations (2024). World Population Prospects 2024: Summary of Results. UN DESA/POP/2024/TR/NO. 9. New York: United Nations. CC BY 3.0 IGO. We read the pages cited; p. gives its printed page.

5 Matzka, J., Bronkalla, O., Tornow, K., Elger, K., and Stolle, C. (2021). Geomagnetic Kp index, version 1.0. GFZ Data Services. The daily Ap index from GFZ's file Kp_ap_Ap_SN_F107_since_1932.txt, read October 30, 2026. CC BY 4.0. The indices are described in Matzka, J., Stolle, C., Yamazaki, Y., Bronkalla, O., and Morschhauser, A. (2021), The geomagnetic Kp index and derived indices of geomagnetic activity, *Space Weather* 19(5), e2020SW002641.

6 WDC-SILSO, Royal Observatory of Belgium, Brussels. Solar cycles: minima and maxima of the 13-month smoothed sunspot number, version 2, read October 30, 2026. CC BY-NC 4.0; only the dates of the minima are used here. The sunspot number is described in Clette, F., and Lefèvre, L. (2016), The new sunspot number: assembling all corrections, *Solar Physics* 291, 2629–2651.

7 Our World in Data. Birth rate, from UN, World Population Prospects (2024), processed by Our World in Data, with its metadata, read October 30, 2026: the series the preprint cites. Its world values equal the UN's crude birth rate [3] to the third decimal in all 74 years. Our World in Data's data are under CC BY 4.0.

8 World Bank. World Development Indicators: Birth rate, crude (per 1,000 people) and Fertility rate, total (births per woman), for the world, last updated October 8, 2026, read October 30, 2026. CC BY 4.0.

9 Belkin, V. ORCID record 0000-0003-0670-0721, public record (works and employment), read October 30, 2026.

10 GBD 2021 Fertility and Forecasting Collaborators (2024). Global fertility in 204 countries and territories, 1950–2021, with forecasts to 2100: a comprehensive demographic analysis for the Global Burden of Disease Study 2021. *The Lancet* 403(10440), 2057–2099. CC BY 4.0. We read the abstract.

11 Randall, W., and Moos, W. S. (1993). The 11-year cycle in human births. *International Journal of Biometeorology* 37(2), 72–77. We read the abstract (PubMed 8330943).

12 Randall, W. (1991). An eleven-year cycle in human births. *International Journal of Biometeorology* 35(1), 33–38. We read the abstract (PubMed 1917125).

13 Bauer, T. K., Bender, S., Heining, J., and Schmidt, C. M. (2013). The lunar cycle, sunspots and the frequency of births in Germany, 1920–1989. *Economics & Human Biology* 11(4), 545–550. We read the abstract (PubMed 23261260).

14 Melnikov, V. N. (2012). Reduced solar activity favors twin maternities. *Twin Research and Human Genetics* 15(1), 133–137. We read the abstract.

15 Skjærvø, G. R., Fossøy, F., and Røskaft, E. (2015). Solar activity at birth predicted infant survival and women's fertility in historical Norway. *Proceedings of the Royal Society B* 282(1801), 20142032. We read the abstract.

16 Pyper, B. J., and Peterman, R. M. (1998). Comparison of methods to account for autocorrelation in correlation analyses of fish data. *Canadian Journal of Fisheries and Aquatic Sciences* 55(9), 2127–2140. We read the abstract.

17 Ashton, B., Hill, K., Piazza, A., and Zeitz, R. (1984). Famine in China, 1958–61. *Population and Development Review* 10(4), 613–645. We read only its bibliographic record; the birth rates on this page are the UN's estimates.

18 United Nations, Department of Economic and Social Affairs, Population Division. World Population Prospects website, frequently asked questions, read October 30, 2026: "The next one is due on 11 July 2027 (World Population Day)."

METHOD

How this was checked

On October 30, 2026, we checked every statement, number and quotation on this page against its source. We first worked from the abstract alone, since SSRN refuses our tools and shows browsers a bot check that we do not attempt; the site's owner then downloaded the preprint's full text from SSRN in his browser, and the page was checked against it before publication [1]. We rebuilt the preprint's calculation from GFZ Potsdam's Ap index, the UN's World Population Prospects 2024 and SILSO's dates of solar minima [5][3] and [6], and compared it with the preprint's two tables: its numbering of the years matches ours in all 77 years, its birth rates match the UN's in all 74, its 12 averages of the birth rate match ours to the second decimal, and its R, p-value and four projections reproduce. No transcript of the S0 News episode was available, so we checked only its title and the label on its link [2]. We read the other sources: seven studies in abstract, among them five on solar activity and births, the UN's report at the pages cited and its website's questions and answers, five sets of data and two records, 18 items in all.

The verdicts and the items tagged "Our analysis" are our own assessment, built on the cited sources. They include the whole re-run: the 12 averages and their check against the preprint's tables, the straight-line comparison, the variants without the famine years, the detrended correlations, the start-year and lag scans, the synthetic birth rates with no solar signal and the trend-free noise, the year-by-year tests, the rebuilt projections, their comparison with the UN's projections and intervals, and the hindcasts of the same formula from earlier years.

Our script, rerun.py, is hosted under Code and numbers and prints every number of ours on this page from the downloaded data; its random runs are seeded, so it reproduces exactly. The preprint's yearly Ap values differ from our averages of GFZ's daily index by up to 0.13, which moves its R only in the fourth decimal, and with its own values the script gives its R exactly. The projections can't yet be scored against world data, because the UN's estimates end in 2023. We redrew no figure from the preprint, which Crossref lists as CC BY-NC-ND; the five charts are our own.

This page was researched and written with Claude, an AI assistant made by Anthropic, and then re-checked against its sources in a separate verification pass.

The verdicts on this page

FALSE	The evidence contradicts the claim.
MISLEADING	Contains something true but leaves a false impression, usually by leaving out key context.
UNSUPPORTED	No evidence we could find backs it up, though it hasn't been strictly disproven.

All ten verdicts, and how we check

CORRECTIONS

Corrections and changes

If we get something wrong, we fix it and record the change below with the date. If a correction changes a verdict, the log says what the old verdict was.

Change log

Oct 30, 2026	Published on factchecked.science after a full check against the sources. Built from the preprint's full text, which the site's owner downloaded from SSRN, our re-run of its calculation and projections on public data (GFZ's Ap index, the UN's World Population Prospects 2024 and SILSO's dates of solar minima), and the S0 News episode's title and link label, since no transcript was available: four claims rated on the site's scale, three of them the paper's and one the episode's, with five charts drawn from our own re-analysis. The projections are to be checked against the UN's next revision, due on 11 July 2027.

Fact-Checked Science is independent. It isn't affiliated with the channels, presenters or authors whose claims it checks.

Last updated Oct 30, 2026