

Bivariate Data Practice Exercise: Fertility

The world is getting increasingly populous. Although much of the world has reached a point where population is either falling or increasing only slowly, there are still places where populations continue to grow quickly.

The quickest ethical way to slow population growth is to slow the rate at which women have children: the fertility rate.

Task

With the data you are given (next pages and separate Excel worksheet) use scatter plots and bivariate methods to say which of the variables given appear to drive women's fertility.

From that suggest which areas of improvement will give the largest reductions in fertility rates.

Suggest problems, improvements and further lines of enquiry.

The Data

Name: The country's common name is given.

Fertility rate: The average number of children each woman has.

Replacement rate is about 2.1 in the western world, moving up to 2.5 or so in countries with child mortality.

GDP per capita: A measure of the wealthy the country's people are. It is per capita, to even out between big and small countries, and is in PPP (purchasing parity) to even out exchange rate issues.

The higher it is the more the people earn, on average.

Log GDP: Because GDP varies over such a wide range, it is often found that its logarithm is a more useful measure.

Each +1 means the GDP per person is 10× as large.

Life expectancy: The average age a person will live.

Also divided into males and females.

Literacy rate: The percentage of people who can read or write to a functioning level.

A separate statistic is given for female literacy, which is often much lower. (Note that these are often quite old, and may not be entirely compatible with the overall literacy rate.)

Gini Coefficient: A measure of how much gap there is between a country's rich and poor.

A large number indicates that the rich earn a lot more than the poor: 25 is very low (Japan and Scandinavia, where almost everyone is well off) to around 60 (South Africa and Columbia, where there are a lot of very poor but also quite a few rich).

Name	Fertility rate	GDP per capita	Log GDP	overall life expectancy	male life expectancy	female life expectancy	Literacy rate	Literacy females	Gini Coefficients
Afghanistan	6.48	900	2.95	43.8	43.9	43.8	28		29
Albania	1.85	8,000	3.9	76.4	73.4	79.7	99.1	79.5	35
Algeria	2.34	7,300	3.86	72.3	70.9	73.7	75.4	61.0	35
Angola	5.64	8,200	3.91				70	54.2	59
Argentina	2.22	14,700	4.17	75.3	71.6	79.1	97.7	97.1	46
Armenia	1.75	5,700	3.76	72	68.4	75.1	99.7	98.0	31
Australia	1.9	41,000	4.61	81.2	78.9	83.6	99	99.0	35
Austria	1.39	40,400	4.61	79.8	76.9	82.6	99		29
Azerbaijan	2.3	10,900	4.04	67.5	63.8	71.2	99.5	98.2	34
Bahamas	2	28,700	4.46	73.5	70.6	76.3	95.8	96.5	
Bahrain	2.23	40,300	4.61	75.6	74.3	77.5	91.4	85.0	
Bangladesh	2.29	1,700	3.23	64.1	63.2	65	55.9	31.8	31
Barbados	1.54	21,800	4.34	77.3	74.4	79.8	99.7	99.7	
Belarus	1.5	13,600	4.13	69	63.1	75.2	99.7	99.5	27
Belgium	1.85	37,800	4.58	79.4	76.5	82.3	99	99.0	33
Belize	2.84	8,400	3.92	76.1	73.3	79.2	75.1		54
Benin	5.38	1,500	3.18	56.7	55.6	57.8	41.7	23.3	39
Bhutan	2.56	5,500	3.74	65.6	64	67.5	52.8	34.0	47
Bolivia	3.37	4,800	3.68	65.6	63.4	67.7	90.7	81.6	57
Bosnia	1.21	6,600	3.82	74.9	72.2	77.4	97.8	94.4	36
Botswana	2.82	14,000	4.15	50.7	50.5	50.7	84.1	81.8	61
Brazil	1.83	10,800	4.03	72.4	68.8	76.1	90	88.8	54
Brunei	2.05	51,600	4.71	77.1	75	79.7	95.3	88.5	
Bulgaria	1.57	13,500	4.13	73	69.5	76.7	98.3	98.2	45
Burkina Faso	5.84	1,200	3.08	52.3	50.7	53.8	28.7	15.2	40
Burundi	4.45	300	2.48	49.6	48.1	51	66.6	45.2	33
Cambodia	2.86	2,100	3.32	59.7	57.3	61.9	76.3	64.1	44
Cameroon	4.54	2,300	3.36	50.4	50	50.8	67.9	73.4	39
Canada	1.63	39,400	4.6	80.7	78.3	82.9	99	99.0	33
Cape Verde	2.66	3,800	3.58	71.7	68.3	74.5	84.8	69.2	51
C.A.R.	4.7	700	2.85	44.7	43.3	46.1	55.2	39.9	56
Chad	6.08	1,600	3.2	50.6	49.3	52	33.6	39.3	40
Chile	1.93	15,400	4.19	78.6	75.5	81.5	96.5	96.1	52
China	1.77	7,600	3.88	73	71.3	74.8	95.9	87.6	42
Colombia	2.4	9,800	3.99	72.9	69.2	76.6	93.2	90.7	58
Comoros	3.89	1,000	3	65.2	63	67.4	74.2	49.3	64
Costa Rica	1.94	11,300	4.05	78.8	76.5	81.2	96.1	96.1	50
Côte d'Ivoire	4.51	1,800	3.26	48.3	47.5	49.3	55.3	43.6	42
Croatia	1.47	17,400	4.24	75.7	72.3	79.2	98.8	97.8	34
Cuba	1.51	9,900	4	78.3	76.2	80.4	99.9	96.9	
Cyprus	1.52	21,000	4.32	79	76.5	81.6	97.9	96.3	
Czech	1.49	25,600	4.41	76.5	73.4	79.5	99	99.0	26
Denmark	1.84	36,600	4.56	78.3	76	80.6	99	99.0	25
Djibouti	3.79	2,800	3.45	54.8	53.6	56	70.3	58.4	40
Dominican R	2.61	8,900	3.95	72.2	69.3	75.5	89.1	84.8	48
Ecuador	2.51	7,800	3.89	75	72.1	78	91	91.0	49
Egypt	2.82	6,200	3.79	71.3	69.1	73.6	66.4	59.4	32
El Salvador	2.3	7,200	3.86	71.9	68.8	74.9	84.1	79.6	47
Eq. Guinea	5.28	36,600	4.56	51.6	50.4	52.8	93.3	78.4	
Eritrea	4.53	600	2.78	58	55.6	60.3	66.6	47.6	
Estonia	1.62	19,100	4.28	71.4	65.9	76.8	99.8	99.8	36
Ethiopia	5.21	1,000	3	52.9	51.7	54.3	35.9	35.1	30
Fiji	2.69	4,400	3.64	68.8	66.6	71.1	94.4	91.9	
Finland	1.86	35,400	4.55	79.3	76.1	82.4	99	100.0	27
France	2	33,100	4.52	80.7	77.1	84.1	99	99.0	33
Gabon	3.24	14,500	4.16	56.7	56.4	57.1	87.7	53.3	41
Gambia	4.97	1,900	3.28	59.4	58.6	60.3	46.5	32.8	47
Georgia	1.58	4,900	3.69	71	67.1	74.8	100	100.0	41
Germany	1.36	35,700	4.55	79.4	76.5	82.1	99	99.0	28
Ghana	3.91	2,500	3.4	60	59.6	60.5	66.6	67.1	43

Greece	1.52	29,600	4.47	79.5	77.1	81.9	97.2	96.5	34
Guatemala	4.02	5,200	3.72	70.3	66.7	73.8	74.5	63.3	54
Guinea	5.33	1,000	3	56	54.4	57.6	39.5	18.1	39
Guinea-Bissau	5.66	1,100	3.04	46.4	44.9	47.9	52.2	27.4	36
Guyana	2.3	7,200	3.86	66.8	64.2	69.9	99	98.5	45
Haiti	3.42	1,200	3.08	60.9	59.1	62.8	62.1	51.2	60
Honduras	3.19	4,200	3.62	70.2	66.9	73.7	83.6	76.3	58
Hong Kong	1.04	45,900	4.66	82.2	79.4	85.1	94.6	90.5	43
Hungary	1.32	18,800	4.27	73.3	69.2	77.4	99.4	99.3	31
Iceland	2.23	38,300	4.58	81.8	80.2	83.3	99	99.0	
India	2.68	3,500	3.54	64.7	63.2	66.4	74.04	48.3	37
Indonesia	2.13	4,200	3.62	70.7	68.7	72.7	92	86.8	37
Iran	1.78	10,600	4.03	71	69.4	72.6	82.3	73.0	38
Iraq	3.93	3,800	3.58	59.5	57.8	61.5	78.1	24.4	31
Ireland	2.07	37,300	4.57	78.9	76.5	81.3	99	99.0	34
Israel	2.96	29,800	4.47	82	80	84	97.1	95.9	39
Italy	1.41	30,500	4.48	80.5	77.5	83.5	98.9	98.3	36
Jamaica	2.36	8,300	3.92	72.6	70	75.2	86.4	91.6	46
Japan	1.37	34,000	4.53	82.6	79	86.1	99	99.0	25
Jordan	3.38	5,400	3.73	72.5	70.8	74.5	91.1	84.7	38
Kazakhstan	2.6	12,700	4.1	67	61.6	72.4	99.6	99.3	31
Kenya	4.86	1,600	3.2	54.1	53	55.2	87	79.7	48
Kiribati		6,200	3.79	77.6	76	79.9	94.5		
Kyrgyzstan	2.8	2,200	3.34	65.9	62	69.9	99.3	98.1	33
Laos	3.42	2,500	3.4	64.4	63	65.8	68.7	63.0	37
Latvia	1.31	14,700	4.17	72.7	67.3	77.7	99.8	99.8	36
Lebanon	1.84	14,400	4.16	72	69.9	74.2	89.6	82.2	
Lesotho	3.26	1,700	3.23	42.6	42.9	42.3	89.7	94.5	53
Liberia	5.81	500	2.7	45.7	44.8	46.6		41.6	38
Libya	2.64	14,000	4.15	74	71.7	76.9	88.9	72.0	
Lithuania	1.55	16,000	4.2	73	67.5	78.3	99.7	99.6	38
Luxembourg	1.59	82,600	4.92	78.7	75.7	81.6	99	100.0	31
Macedonia	1.44	9,700	3.99	74.2	71.8	76.6	97.1	94.1	44
Madagascar	4.62	900	2.95	59.4	57.7	61.3	70.7	62.5	47
Malawi	5.46	800	2.9	48.3	48.1	48.4	73.7	49.8	39
Malaysia	2.51	14,700	4.17	74.2	72	76.7	92.5	85.4	46
Maldives	2	6,900	3.84	68.5	67.6	69.5	97	94.7	37
Mali	6.52	1,200	3.08	54.5	52.1	56.6	26.2	39.6	39
Malta	1.44	25,600	4.41	79.4	77.3	81.3	92.4	93.9	
Mauritania	4.39	2,100	3.32	64.2	62.4	66	57.5	31.9	39
Mauritius	1.5	14,000	4.15	72.8	69.5	76.2	87.9	82.7	
Mexico	2.07	13,900	4.14	76.2	73.7	78.6	93.4	85.3	52
Moldova	1.5	2,500	3.4	68.9	65.1	72.5		98.6	38
Mongolia	1.99	3,600	3.56	66.8	63.9	69.9	97.5	99.0	33
Montenegro	1.64	10,100	4	74.5	72.4	76.8			30
Morocco	2.33	4,800	3.68	71.2	69	73.4	56.1	39.6	41
Mozambique	4.97	1,000	3	39.2	38.3	39	55.1	32.7	46
Myanmar	2.28			62.1	59	65.3	92		
Namibia	3.29	6,900	3.84	52.9	52.5	53.1	88.5	83.7	74
Nepal	2.82	1,200	3.08	63.8	63.2	64.2	68.2	27.6	47
Netherlands	1.79	40,300	4.61	79.8	77.5	81.9	99	99.0	31
New Zealand	2.14	27,700	4.44	80.2	78.2	82.2	99	99.0	36
Nicaragua	2.68	3,000	3.48	72.9	69.9	76	78	67.8	52
Niger	7.07	700	2.85	56.9	57.8	56	28.7	15.1	34
Nigeria	5.6	2,500	3.4	46.9	46.4	47.3	72	60.6	43
North Korea	1.85	1,800	3.26	67.3	65.1	69.3	99	99.0	
Norway	1.98	54,600	4.74	80.2	77.8	82.5	99	100.0	26
Oman	2.98	25,600	4.41	75.6	74.2	77.5	81.4	73.5	
Pakistan	3.87	2,500	3.4	65.5	65.2	65.8	58.2	36.0	33
Panama	2.52	13,000	4.11	75.5	73	78.2	93.6	91.9	52
Papua New Guinea	4.01	2,500	3.4	57.2	54.6	60.4	60.1	59.3	51

Paraguay	2.98	5,200	3.72	71.8	69.7	73.9	94.6	93.0	52
Peru	2.53	9,200	3.96	71.4	68.9	74	89.6	89.4	48
Philippines	3.03	3,500	3.54	71.7	69.5	73.9	93.4	95.8	44
Poland	1.4	18,800	4.27	75.6	71.3	79.8	99.5	99.7	34
Portugal	1.32	23,000	4.36	78.1	75	81.2	94.9	91.3	38
Puerto Rico	1.65	16,300	4.21	78.7	74.7	82.7		94.4	
Qatar	2.36	179,000	5.25	75.6	75.2	76.4	94.7	88.6	41
Romania	1.38	11,600	4.06	72.5	69	76.1	97.7	97.7	31
Russia	1.55	15,900	4.2	65.5	61.83	72.6	99.5	99.5	42
Rwanda	5.33	1,100	3.04	46.2	44.6	47.8	70.7	64.7	53
Samoa	3.85	5,500	3.74	71.5	68.5	74.8	98.8	99.7	
Sao Tome	3.72	1,800	3.26	65.5	63.6	67.4	88.8	77.9	51
Saudi Arabia	3.04	24,200	4.38	72.8[6]	70.9	75.3	86.1	70.8	
Senegal	4.74	1,900	3.28	63.1	61	65.1	49.7	30.7	39
Serbia	1.4	10,900	4.04	74	71.7	76.3	97.8	94.1	28
Seychelles	2.3	23,200	4.37				91.8	92.3	66
Sierra Leone	5.17	900	2.95	42.6	41	44.1	40.9	24.4	43
Singapore	1.22	62,100	4.79	80	78	81.9	94.7	89.7	42
Slovakia	1.41	22,000	4.34	74.7	70.7	78.5	99	99.6	26
Slovenia	1.53	28,200	4.45	77.9	74.1	81.5	99.7	99.6	31
Solomon Islands	3.78	2,900	3.46	63.6	62.7	64.5	76.6		
Somalia	6.35	600	2.78	48.2	46.9	49.4		25.8	
South Africa	2.51	10,700	4.03	49.3	48.8	49.7	88	85.7	67
South Korea	1.28	30,000	4.48	78.6	75	82.2	99	97.0	32
Spain	1.4	29,400	4.47	80.9	77.7	84.2	97.9	97.2	35
Sri Lanka	2.31	5,000	3.7	72.4	68.8	76.2	94.2	90.0	40
Sudan	4.06	2,300	3.36	58.6	57.1	60.1	70.2	50.5	
Suriname	2.37	9,700	3.99	70.2	67	73.6	90.4	87.2	53
Swaziland	3.45	4,500	3.65	39.6	39.8	39.4	86.9	80.8	51
Sweden	1.94	39,100	4.59	80.9	78.7	83	99	99.0	25
Switzerland	1.5	42,600	4.63	82.1	80	84.2	99	99.0	34
Syria	3.14	4,800	3.68	74.1	72.3	76.1	84.2	73.6	36
Taiwan		35,700	4.55	78.32	75.5	81.36		79.0	
Tajikistan	3.35	2,000	3.3	66.7	64.1	69.4	99.6	99.1	34
Tanzania	5.52	1,400	3.15	52.5	51.4	53.6	72.9	70.7	38
Thailand	1.82	8,700	3.94	70.6	66.5	75	94.1	94.6	42
Togo	4.17	900	2.95	58.4	56.7	60.1	53.2	46.9	34
Tonga	3.93	6,100	3.79	73.3	72.3	74.3	99.2	99.0	
Trinidad	1.65	21,200	4.33	69.8	67.8	71.8	98.7	98.0	40
Tunisia	2.05	9,400	3.97	73.9	71.9	76	77.7	65.3	41
Turkey	2.1	12,300	4.09	71.8	69.4	74.3	90.8	79.6	43
Turkmenistan	2.43	7,500	3.88	63.2	59	67.5	99.5	98.3	41
Uganda	6.25	1,300	3.11	51.5	50.8	52.2	73.3	60.4	44
Ukraine	1.46	6,700	3.83	67.9	62.1	73.8	99.7	99.6	28
U.A.E.	1.9	49,600	4.7	78.7	77.2	81.5	90	81.7	
United Kingdom	2	34,800	4.54	79.4	77.2	81.6	99	99.0	36
United States	2.05	47,200	4.67	78.3	75.6	80.8	99	99.0	41
Uruguay	2	13,700	4.14	76.4	72.8	79.9	98.3	98.4	42
Uzbekistan	2.65	3,100	3.49	67.2	64	70.4	96.9	99.0	37
Vanuatu	3.88	5,100	3.71	70	68.3	72.1	80.2		
Venezuela	2.51	12,700	4.1	73.7	70.9	76.8	95.2	93.1	44
Vietnam	2.03	3,100	3.49	74.2	72.3	76.2	92.8	92.3	38
Yemen	5.1	2,700	3.43	62.7	61.1	64.3	62.4	30.0	38
Zambia	5.74	1,500	3.18	42.4	42.1	42.5	70.9	74.8	51
Zimbabwe	3.36	500	2.7	43.5	44.1	42.6	91.9	87.2	50