

# Week 4 In-class Assignment

Felix Ho

2024-09-30

```
finaldata <- read.csv(here("data", "mergealldata.csv"), header = TRUE)
names(finaldata)
```

```
[1] "country_name" "ISO"           "region"        "year"          "gdp1000"
[6] "OECD"         "OECD2023"     "popdens"       "urban"         "agedep"
[11] "male_edu"     "temp"         "rainfall1000" "matmor"        "infmor"
[16] "neomor"      "un5mor"       "drought"       "earthquake"    "totdeath"
[21] "armcon"
```

The main exposure variable is armed conflict. As per the paper, there are 10 covariates, country and year fixed effects, and conflict lagged by 1 year.

Corresponding to Table 2 in the paper:

- armcon = armed conflict (binary) variable lagged by 1 year

## 10 covariates:

- gdp1000 = GDP per capita in US dollars (unit is scaled up by 1,000)
- OECD = OECD member
- popdens = population density represents the % of the population living in a density of >1,000 people/km<sup>2</sup>
- urban = urban residence represents the % of the population living in urban areas
- agedep = age dependency ratio represents the proportion of dependents (aged < 15 years or > 64 years) per 100 working-age individuals
- male\_edu = male education expressed as years per capita (age-standardised)
- temp = temperature in degrees Celsius and is the mean population-weighted annual temperature

- rainfall1000 = mean population-weighted annual rainfall in mm per year (scaled down by 1,000)
- earthquake = earthquake binary variable (absence or presence)
- drought = drought binary variable (absence or presence)

### Primary outcomes:

- matmor = maternal mortality rate
- un5mor = under-5 mortality rate
- infmor = infant mortality rate
- neomor = neonatal mortality rate

### Note:

- totdeath = total number of battle related deaths

Check observations from Canada.

```
finaldata %>%
  filter(country_name == "Canada")
```

	country_name	ISO	region	year	gdp1000	OECD	OECD2023	popdens
1	Canada	CAN	Northern America	2000	24.27100	1	1	66.19704
2	Canada	CAN	Northern America	2001	23.82206	1	1	66.45361
3	Canada	CAN	Northern America	2002	24.25534	1	1	66.71112
4	Canada	CAN	Northern America	2003	28.30046	1	1	66.96384
5	Canada	CAN	Northern America	2004	32.14368	1	1	67.21715
6	Canada	CAN	Northern America	2005	36.38251	1	1	67.47283
7	Canada	CAN	Northern America	2006	40.50406	1	1	67.73674
8	Canada	CAN	Northern America	2007	44.65990	1	1	67.99444
9	Canada	CAN	Northern America	2008	46.71051	1	1	68.25765
10	Canada	CAN	Northern America	2009	40.87631	1	1	68.53354
11	Canada	CAN	Northern America	2010	47.56208	1	1	68.80739
12	Canada	CAN	Northern America	2011	52.22370	1	1	69.04842
13	Canada	CAN	Northern America	2012	52.66909	1	1	69.27604
14	Canada	CAN	Northern America	2013	52.63517	1	1	69.50772
15	Canada	CAN	Northern America	2014	50.95600	1	1	69.76876
16	Canada	CAN	Northern America	2015	43.59614	1	1	69.98853
17	Canada	CAN	Northern America	2016	42.31560	1	1	70.21484
18	Canada	CAN	Northern America	2017	45.12943	1	1	70.40863
19	Canada	CAN	Northern America	2018	46.54864	1	1	70.63614

20	Canada CAN Northern America 2019 46.32867					1	1 70.83794			
	urban	agedep	male_edu	temp	rainfall1000	matmor	infmor	neomor	un5mor	
1	56.14335	46.34463	12.30281	5.486244	0.9971559	9	5.3	3.8	6.2	
2	56.40270	45.89632	12.35258	6.469105	0.8644873	10	5.3	3.8	6.2	
3	56.67093	45.46660	12.40182	5.979147	0.9460938	10	5.3	3.9	6.2	
4	56.94365	45.07468	12.45053	5.416964	1.0189234	10	5.3	3.9	6.2	
5	57.20020	44.67374	12.49870	5.556961	1.0008237	10	5.3	3.9	6.1	
6	57.41671	44.26641	12.54635	6.187472	1.0367199	11	5.2	3.9	6.1	
7	57.59143	43.96370	12.59349	6.895084	1.0917386	11	5.2	3.9	6.0	
8	57.75691	43.83612	12.64015	5.900051	1.0134091	11	5.1	3.8	6.0	
9	57.97905	43.85426	12.68634	5.650118	1.0693435	12	5.1	3.8	5.9	
10	58.24228	43.94937	12.73207	5.398867	0.9928497	12	5.0	3.8	5.8	
11	58.52809	44.13587	12.77735	6.781766	1.0379754	11	5.0	3.8	5.7	
12	58.81437	44.53578	12.82218	6.269133	1.1343442	11	4.9	3.7	5.7	
13	59.05573	45.18393	12.86660	7.249497	0.9747708	11	4.9	3.7	5.6	
14	59.19713	45.95404	12.91059	5.954381	1.0282075	11	4.8	3.6	5.5	
15	59.30361	46.75493	12.95414	5.584650	1.0377695	11	4.7	3.6	5.4	
16	59.42627	47.59164	12.99723	6.436884	0.9632446	11	4.7	3.6	5.4	
17	59.50521	48.41410	13.03988	7.184514	0.9677826	10	4.6	3.5	5.3	
18	59.59325	49.14806	13.08210	6.539669	1.0995322	10	4.6	3.4	5.2	
19	59.68433	49.80166	13.12388	6.539677	1.0991469	NA	4.5	3.3	5.1	
20	59.75984	50.47739	13.16522	6.539633	1.0987523	NA	4.4	3.3	5.1	
	drought	earthquake	totdeath	armcon						
1	0		0	11	0					
2	0		0	23	0					
3	0		0	1	0					
4	0		0	0	0					
5	0		0	0	0					
6	0		0	0	0					
7	0		0	0	0					
8	0		0	0	0					
9	0		0	0	0					
10	0		0	0	0					
11	0		0	0	0					
12	0		0	0	0					
13	0		0	0	0					
14	0		0	0	0					
15	0		0	0	0					
16	0		0	0	0					
17	0		0	0	0					
18	0		0	0	0					
19	0		0	0	0					
20	0		0	0	0					

Check observations from Ecuador.

```
finaldata %>%
  filter(country_name == "Ecuador")
```

	country_name	ISO	region	year	gdp1000	OECD	OECD2023
1	Ecuador	ECU	Latin America and the Caribbean	2000	1.451531	0	0
2	Ecuador	ECU	Latin America and the Caribbean	2001	1.904814	0	0
3	Ecuador	ECU	Latin America and the Caribbean	2002	2.184209	0	0
4	Ecuador	ECU	Latin America and the Caribbean	2003	2.438344	0	0
5	Ecuador	ECU	Latin America and the Caribbean	2004	2.703566	0	0
6	Ecuador	ECU	Latin America and the Caribbean	2005	3.014310	0	0
7	Ecuador	ECU	Latin America and the Caribbean	2006	3.340841	0	0
8	Ecuador	ECU	Latin America and the Caribbean	2007	3.579032	0	0
9	Ecuador	ECU	Latin America and the Caribbean	2008	4.260433	0	0
10	Ecuador	ECU	Latin America and the Caribbean	2009	4.240703	0	0
11	Ecuador	ECU	Latin America and the Caribbean	2010	4.640246	0	0
12	Ecuador	ECU	Latin America and the Caribbean	2011	5.202656	0	0
13	Ecuador	ECU	Latin America and the Caribbean	2012	5.678456	0	0
14	Ecuador	ECU	Latin America and the Caribbean	2013	6.050355	0	0
15	Ecuador	ECU	Latin America and the Caribbean	2014	6.374631	0	0
16	Ecuador	ECU	Latin America and the Caribbean	2015	6.130587	0	0
17	Ecuador	ECU	Latin America and the Caribbean	2016	6.079089	0	0
18	Ecuador	ECU	Latin America and the Caribbean	2017	6.246404	0	0
19	Ecuador	ECU	Latin America and the Caribbean	2018	6.321349	0	0
20	Ecuador	ECU	Latin America and the Caribbean	2019	6.233258	0	0

  

	popdens	urban	agedep	male_edu	temp	rainfall1000	matmor	infmor
1	23.27432	36.19963	67.44216	7.738627	19.54855	1.4201653	122	24.7
2	23.39372	36.67994	66.57356	7.843942	19.66622	1.1667746	117	23.4
3	23.52087	37.08903	65.65488	7.949449	20.24695	1.4577981	110	22.4
4	23.58358	37.23792	64.71472	8.055240	20.05016	1.5781807	100	21.5
5	38.43743	37.39268	63.78049	8.161433	20.10136	1.0683450	94	20.7
6	38.55361	37.36968	62.86530	8.268176	19.88163	0.8555447	94	19.9
7	38.65018	37.47567	61.97042	8.375587	20.07087	1.1114502	90	19.2
8	38.76505	37.68172	61.11422	8.483729	19.49536	1.0899082	85	18.5
9	38.83977	37.67445	60.31015	8.592603	19.85711	1.6184816	82	17.7
10	38.92613	37.39437	59.55262	8.702180	20.39298	1.0870796	80	17.0
11	39.03066	37.26838	58.83793	8.812409	20.11160	1.7045703	78	16.3
12	39.09586	37.61553	58.16553	8.923172	19.86633	1.4518388	76	15.6
13	39.13343	38.00733	57.51051	9.034284	20.19000	1.7520003	71	14.9
14	39.18619	38.22511	56.84804	9.145523	19.85177	1.3735605	67	14.3
15	39.27871	38.12421	56.17001	9.256679	20.42252	1.2572257	65	13.7

16	39.38824	38.15633	55.46511	9.367582	20.95595	1.7284273	63	13.2
17	39.46201	38.45745	54.73369	9.478071	20.77476	1.3168761	61	12.8
18	39.53609	38.65993	53.99096	9.587993	20.53262	1.9544485	59	12.4
19	39.58380	38.87253	53.12249	9.697221	20.53714	1.9573265	NA	12.0
20	39.75109	39.05144	52.29278	9.805670	20.54169	1.9602443	NA	11.6

	neomor	un5mor	drought	earthquake	totdeath	armcon
1	14.1	29.5	0	0	0	0
2	13.4	28.0	0	0	0	0
3	12.7	26.6	0	0	2	0
4	12.1	25.4	0	0	0	0
5	11.6	24.4	0	0	26	1
6	11.1	23.5	0	0	0	0
7	10.6	22.6	0	0	0	0
8	10.2	21.7	0	0	0	0
9	9.7	20.8	0	0	0	0
10	9.3	19.9	1	0	25	1
11	8.9	19.0	0	0	0	0
12	8.5	18.1	0	0	0	0
13	8.1	17.3	0	0	0	0
14	7.8	16.6	1	0	0	0
15	7.5	15.9	0	1	0	0
16	7.3	15.4	0	0	0	0
17	7.1	14.8	0	1	0	0
18	6.9	14.4	0	0	0	0
19	6.9	13.9	0	0	0	0
20	6.8	13.4	0	1	0	0

Determine the classes of the variables.

```
glimpse(finaldata)
```

Rows: 3,720

Columns: 21

```
$ country_name <chr> "Afghanistan", "Afghanistan", "Afghanistan", "Afghanistan~
$ ISO          <chr> "AFG", "AFG", "AFG", "AFG", "AFG", "AFG", "AFG", "AFG", "~
$ region       <chr> "Southern Asia", "Southern Asia", "Southern Asia", "South~
$ year         <int> 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 200~
$ gdp1000      <dbl> NA, NA, 0.1835328, 0.2004626, 0.2216576, 0.2550551, 0.274~
$ OECD         <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ~
$ OECD2023     <int> 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, ~
$ popdens      <dbl> 14.13654, 14.23156, 14.32270, 14.40691, 15.21947, 15.3361~
$ urban        <dbl> 16.25324, 16.25661, 16.42654, 16.60701, 16.71367, 16.8509~
```

```

$ agedep      <dbl> 108.34663, 108.98989, 109.34716, 109.44753, 109.28682, 10~
$ male_edu    <dbl> 2.762086, 2.856936, 2.954241, 3.054121, 3.156706, 3.26213~
$ temp        <dbl> 12.69959, 12.85570, 12.71081, 12.16592, 13.04643, 12.2314~
$ rainfall1000 <dbl> 0.2763704, 0.2793079, 0.3805710, 0.4288939, 0.3754336, 0.~
$ matmor      <int> 1450, 1390, 1300, 1240, 1180, 1140, 1120, 1090, 1030, 993~
$ infmor      <dbl> 90.5, 87.9, 85.3, 82.7, 80.0, 77.3, 74.6, 71.9, 69.2, 66.~
$ neomor      <dbl> 60.9, 59.7, 58.5, 57.2, 55.9, 54.6, 53.2, 51.7, 50.3, 48.~
$ un5mor      <dbl> 129.2, 125.2, 121.1, 116.9, 112.6, 108.4, 104.1, 99.9, 95~
$ drought     <int> 1, 0, 0, 0, 0, 0, 1, 0, 1, 0, 0, 1, 0, 0, 0, 0, 0, 1, ~
$ earthquake  <int> 0, 1, 1, 1, 1, 1, 1, 0, 0, 1, 1, 0, 1, 1, 0, 1, 0, 0, 0, ~
$ totdeath    <int> 5065, 5394, 5553, 1157, 944, 817, 1711, 4982, 7020, 5660,~
$ armcon      <int> 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, ~

```

Not clear what OECD2023 stands for. How is it different from OECD?

View the key summary statistics of numeric variables and the number of NA's for the variables.

```
summary(finaldata)
```

country_name	ISO	region	year
Length:3720	Length:3720	Length:3720	Min. :2000
Class :character	Class :character	Class :character	1st Qu.:2005
Mode :character	Mode :character	Mode :character	Median :2010
			Mean :2010
			3rd Qu.:2014
			Max. :2019

  

gdp1000	OECD	OECD2023	popdens
Min. : 0.1105	Min. :0.000	Min. :0.0000	Min. : 0.00
1st Qu.: 1.2383	1st Qu.:0.000	1st Qu.:0.0000	1st Qu.:14.79
Median : 4.0719	Median :0.000	Median :0.0000	Median :27.52
Mean : 11.4917	Mean :0.171	Mean :0.1882	Mean :30.57
3rd Qu.: 13.1531	3rd Qu.:0.000	3rd Qu.:0.0000	3rd Qu.:40.72
Max. :123.6787	Max. :1.000	Max. :1.0000	Max. :99.86
NA's :62			NA's :20

  

urban	agedep	male_edu	temp
Min. : 0.1025	Min. : 16.17	Min. : 1.067	Min. : -2.405
1st Qu.:17.2872	1st Qu.: 47.94	1st Qu.: 5.904	1st Qu.:12.928
Median :30.2535	Median : 55.51	Median : 8.368	Median :21.958
Mean :30.6948	Mean : 61.94	Mean : 8.258	Mean :19.625
3rd Qu.:41.6558	3rd Qu.: 77.11	3rd Qu.:10.849	3rd Qu.:25.869

Max. :93.4135	Max. :111.48	Max. :14.441	Max. :29.676
NA's :20		NA's :20	NA's :20
rainfall1000	matmor	infmor	neomor
Min. :0.01993	Min. : 2.0	Min. : 1.60	Min. : 0.80
1st Qu.:0.59146	1st Qu.: 17.0	1st Qu.: 7.60	1st Qu.: 4.90
Median :1.01288	Median : 66.0	Median : 18.90	Median :12.10
Mean :1.20216	Mean : 210.6	Mean : 28.90	Mean :16.18
3rd Qu.:1.68706	3rd Qu.: 299.8	3rd Qu.: 44.52	3rd Qu.:25.32
Max. :4.71081	Max. :2480.0	Max. :138.10	Max. :60.90
NA's :20	NA's :426	NA's :20	NA's :20
un5mor	drought	earthquake	totdeath
Min. : 2.00	Min. :0.00000	Min. :0.00000	Min. : 0.0
1st Qu.: 9.00	1st Qu.:0.00000	1st Qu.:0.00000	1st Qu.: 0.0
Median : 22.20	Median :0.00000	Median :0.00000	Median : 0.0
Mean : 40.50	Mean :0.08737	Mean :0.08333	Mean : 361.1
3rd Qu.: 61.33	3rd Qu.:0.00000	3rd Qu.:0.00000	3rd Qu.: 2.0
Max. :224.90	Max. :1.00000	Max. :1.00000	Max. :78644.0
NA's :20			
armcon			
Min. :0.0000			
1st Qu.:0.0000			
Median :0.0000			
Mean :0.1892			
3rd Qu.:0.0000			
Max. :1.0000			

The median of gdp1000 (4.0719) appears to be far from the mean (11.4917). The distribution of gdp1000 may be positively skewed. The median of matmor (66.0) appears to be far from the mean (210.6). The distribution of matmor may be positively skewed. The median of infmor (18.90) appears to be far from the mean (28.90). The distribution of infmor may be positively skewed. The median of un5mor (22.20) appears to be far from the mean (40.50). The distribution of un5mor may be positively skewed. There is a lot of NA's for matmor (426).

```
table(finaldata$OECD)
```

```

  0    1
3084 636
```

OECD is a binary variable. Maybe 0 and 1 represents nonmember and member of OECD, respectively?

Focus on countries with high matmor.

```
highmatmor <- finaldata %>%  
  select(country_name, year, matmor) %>%  
  arrange(desc(matmor))  
highmatmor[1:20,]
```

	country_name	year	matmor
1	Sierra Leone	2000	2480
2	Sierra Leone	2001	2250
3	Sierra Leone	2002	2080
4	Sierra Leone	2003	1960
5	Sierra Leone	2004	1850
6	Sierra Leone	2005	1760
7	South Sudan	2000	1730
8	South Sudan	2001	1690
9	Sierra Leone	2006	1680
10	South Sudan	2002	1660
11	Sierra Leone	2007	1610
12	South Sudan	2003	1610
13	South Sudan	2004	1550
14	Sierra Leone	2008	1530
15	South Sudan	2005	1480
16	Afghanistan	2000	1450
17	Sierra Leone	2009	1450
18	Chad	2000	1420
19	Chad	2001	1410
20	South Sudan	2006	1410

The countries with high matmor do not appear to be developed countries, which make sense.