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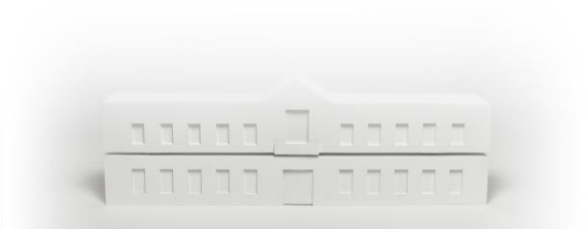

Impact of the COVID-19 pandemic on dependent persons in Castilla-La Mancha (Spain): Mortality and excess mortality

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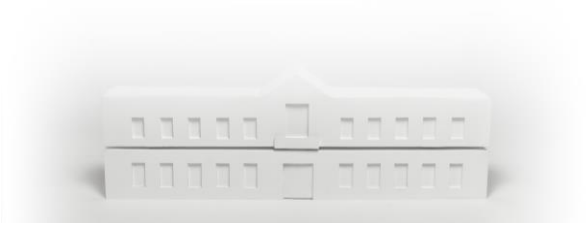

Research Group: Economy. Food and Society

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Some questions:

- Are differences between pandemic or not pandemic period in the mortality in dependent population?
- Mortality risks factor are the same?
- How much is the excess mortality?

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Data reception process

Fecha	Ola	Descripción	N
30/06/2018	II	Included in the database until 30/06/2018	54,359
31/12/2018	III	Included in the database until 31/12/2018	57,610
30/06/2019	IV	Included in the database until 30/06/2019	59,492
31/12/2019	V	Included in the database until 31/12/2019	61,597
30/06/2020	VI	Included in the database until 30/06/2020	59,516

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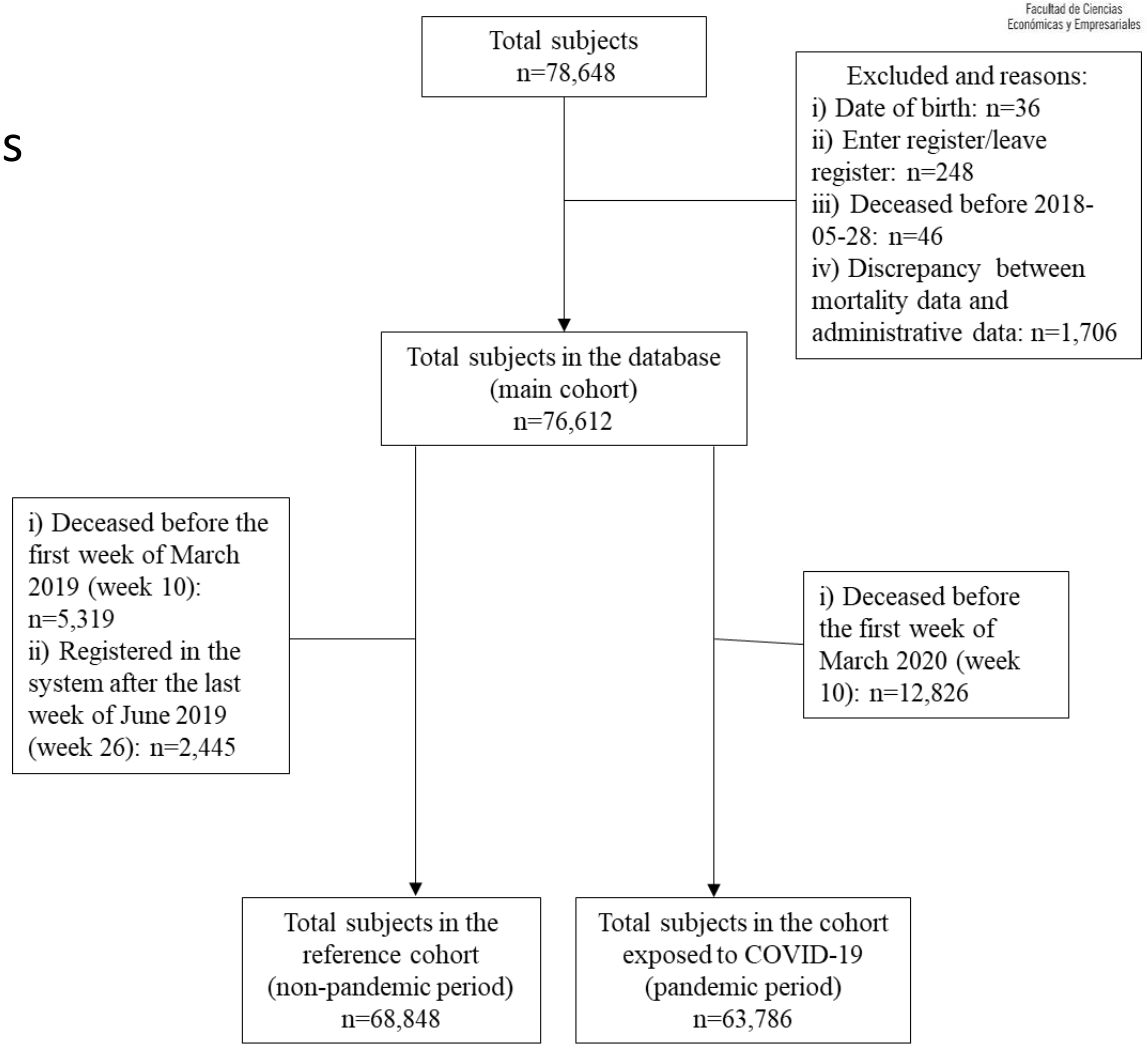
Data cleaning and establishment of cohorts



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Variables included in the Long Term Care system

Type of variable	Variable
Sociodemographic	Sex
	Date of birth
	Municipality and code for municipality
	Province
	Nationality
	Size of household
In the system	Date registered in the system
	Date the benefit was determined
	Level of dependence
Economic benefits	For family care
	Linked to the service
	Personal care
Provision of services	Residential care
	Home help
	Telecare
	Day-care/Night-care centre
	Promotion of personal autonomy

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Variables built upon those included in the system

Type of variable	Variable
Sociodemographic	Age (on any date of reference)
	Number of inhabitants in the municipality
	Number of inhabitants in the municipality by sex
	Area of municipality (km^2)
	Number of care homes in the municipality
	Ownership of care home (public/private)
	Number of care home places in the municipality

Characteristics of the subjects in the cohort exposed to COVID-19 (n = 63,786) and the reference cohort (n = 68,848)

		Cohort exposed to COVID-19			
Variables		Total (n=63,786)	Men (n=22,221)	Women (n=41,565)	P
		%	%	%	
Deceased (Mortality rate)		8.13	8.64	7.85	<0.001
Age	<65	21.57	35.24	14.26	<0.001
	65-80	16.92	17.59	16.56	
	80-90	39.16	30.40	43.85	
	>90	22.35	16.77	25.33	
Level	Level 1	34.84	32.83	35.91	<0.001
	Level 2	33.66	34.75	33.08	
	Level 3	31.5	32.42	31.01	
Care home	No	80.12	80.12	80.13	0.991
	Yes	19.88	19.88	19.87	
Province	Albacete	22.57	23.24	22.21	<0.001
	Ciudad Real	26.00	24.71	26.70	
	Cuenca	15.19	15.30	15.13	
	Guadalajara	9.61	9.98	9.41	
	Toledo	26.63	26.77	26.55	

Note: An χ^2 analysis was performed to examine differences by sex.
a. The number of deceased in this table includes persons whose death was registered between the first week of March (week 10) and the last full week of June (week 26). In this sense. the value can be interpreted as the mortality rate for the period.

Characteristics of the subjects in the cohort exposed to COVID-19 (n = 63,786) and the reference cohort (n = 68,848)

		Reference cohort			
Variables		Total (n=68,848)	Men (n=24,086)	Women (n=44,762)	P
		%	%	%	
Deceased (Mortality rate)		3.39	3.72	2.00	<0.001
Age	<65	19.83	32.15	13.2	<0.001
	65-80	16.03	17.07	15.47	
	80-90	38.78	31.26	42.83	
	>90	25.36	19.52	28.50	
Level	Level 1	32.48	30.85	33.35	<0.001
	Level 2	33.64	34.67	33.09	
	Level 3	33.88	34.48	33.56	
Care home	No	78.28	78.35	78.25	0.778
	Yes	21.72	21.65	21.75	
Province	Albacete	22.31	22.72	22.10	<0.001
	Ciudad Real	25.34	24.11	26.00	
	Cuenca	15.28	15.53	15.14	
	Guadalajara	9.77	10.11	9.58	
	Toledo	27.3	27.53	27.18	

Note: An χ^2 analysis was performed to examine differences by sex.
a. The number of deceased in this table includes persons whose death was registered between the first week of March (week 10) and the last full week of June (week 26). In this sense. the value can be interpreted as the mortality rate for the period.

Mortality Rate

$$MR_t = \frac{d_t}{N_t - \sum_{i=1}^{t-1} d_i}$$

Where:

MR_t is the mortality rate in week t;

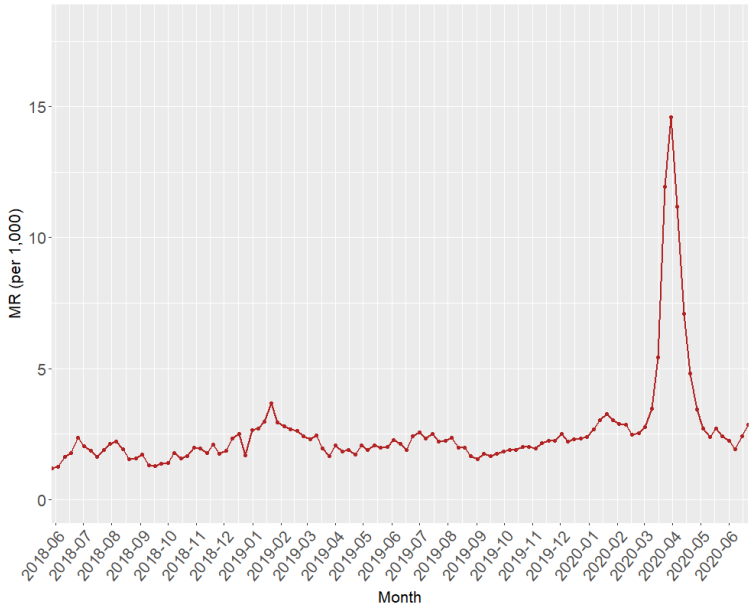
d_t is the number of deceased in week t;

N_t is the number of dependent persons included in the system up to week t; and

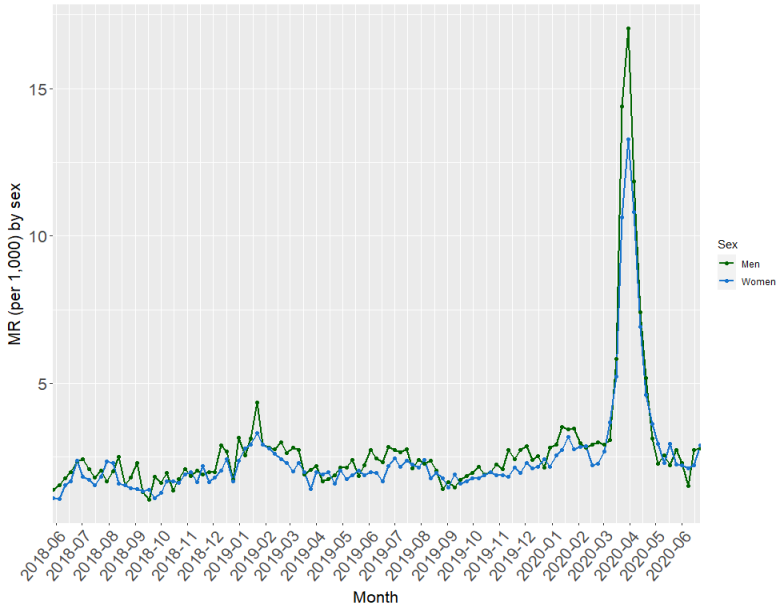
$\sum_{i=1}^{t-1} d_i$ is the sum of the deceased from the first week until the week before t - cumulative deaths

Once the mortality rate was calculated. it was expressed as the mortality rate per 1,000 inhabitants.

Mortality rate (MR) per 1,000 inhabitants



Mortality rate (MR) per 1,000 inhabitants. men and women



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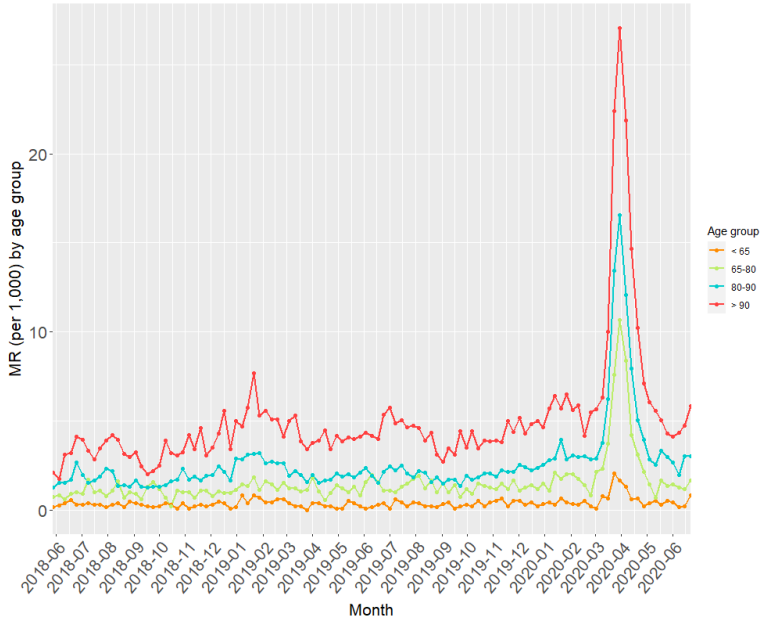
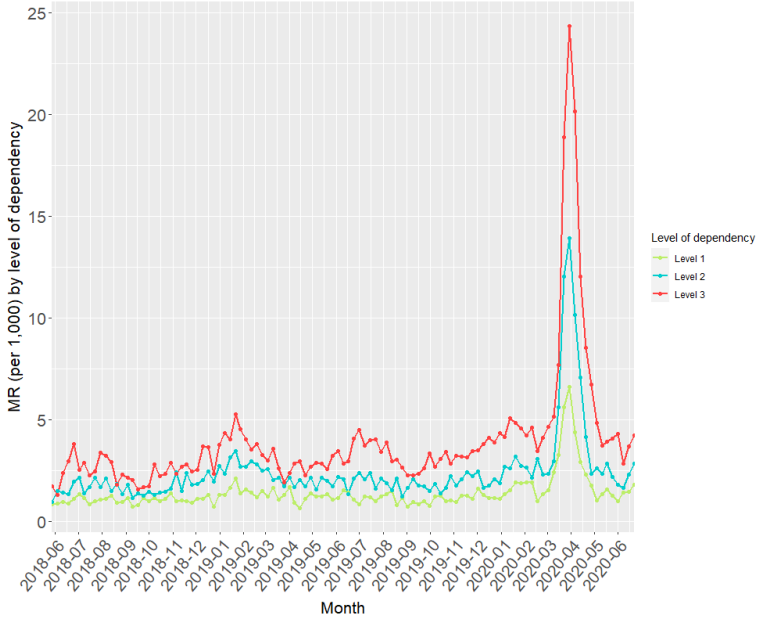
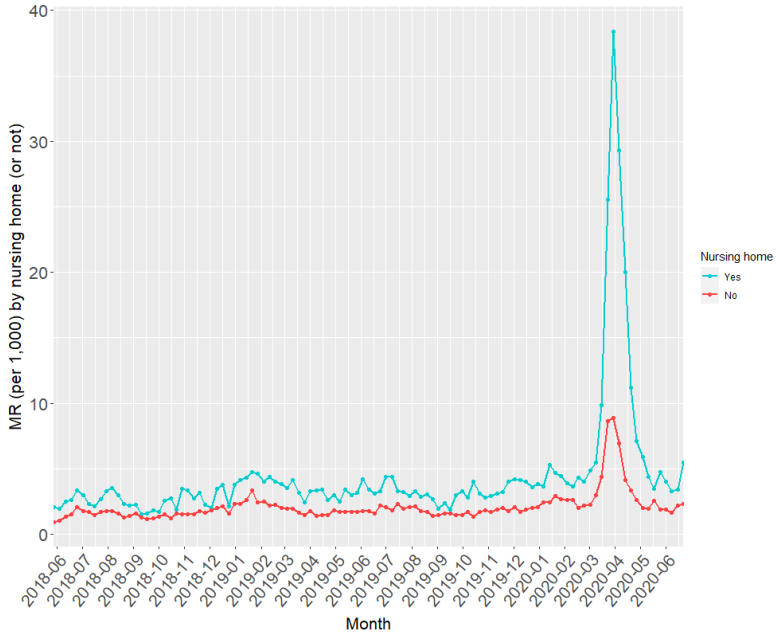
Mortality rate (MR) per 1,000 inhabitants by age



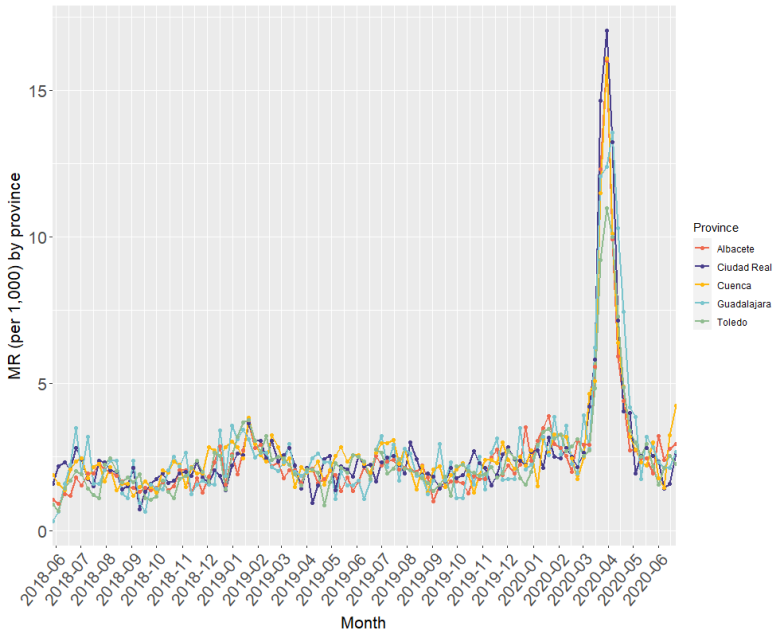
Mortality rate (MR) per 1,000 inhabitants by level of dependency



Mortality rate (MR) per 1.000 inhabitants nursing/care home vs. no



Mortality rate (MR) per 1.000 inhabitants by province



Excess Mortality

$$Excess\ Mortality = \sum Observed\ deaths_{\ i} - \overline{Deaths_i}$$

Where:

- *i:* category (general population. sex. age. etc.)

- Observed deaths: deceased people in each category in the weeks 10-26 of 2020

- Mean deaths: 1) mean mortality rate for each category from week 22 of 2018 to week 9 of 2020; 2) multiplication of this mean mortality rate by dependent population in each category in the weeks 10-26 of 2020

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Excess Mortality and weekly excess mortality for weeks 10-26 de 2020

		Mortality excess	Weekly mean mortality excess (IC 95%)
General population		3001.89	176.58 (51.18; 301.98)
Sex	Men	1101.71	64.81 (12.52; 117.09)
	Women	1900.49	111.79 (38.32; 185.27)
Age	<65	77.89	4.58 (0.75; 8.41)
	65-80	362.57	21.33 (5.54; 37.11)
	80-90	1420.14	83.54 (28.61; 138.46)
	>90	1270.80	74.75 (23.51; 126)
Level of dependence	Grado 1	470.15	27.66 (9.06; 46.25)
	Grado 2	945.62	55.62 (14.09; 97.16)
	Grado 3	1651.39	97.14 (31.12; 163.16)
Care Home	No	1560.51	87.43 (26.83; 148.03)
	Yes	1486.32	91.79 (27.78; 157.81)
Province	Albacete	690.50	40.62 (11.38; 69.86)
	Ciudad Real	871.39	51.26 (10.77; 91.74)
	Cuenca	444.62	26.16 (6.8; 45.5)
	Guadalajara	340.43	20.03 (7.59; 32.46)
	Toledo	655.08	38.53 (12.55; 64.52)

Mortality risk factors: method

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 SEX + \beta_2 AGE + \beta_3 DL + \beta_4 NH + \beta_5 PROV$$

- Multiple logistic regression was performed on the cohort exposed to COVID-19 and the reference cohort

- Dichotomous dependent variable was death in these periods (deceased = 1. not deceased = 0).

Independent Variables:

-Sex. (male=1. female=0)

-Age. categorized age (<65=1. 65-80=2. 80-90=3. >90=4)

-NH. Level of dependence (level 1=1. level 2=2. level 3=3)

-PROV. Provinces de CLM (Albacete=1. Ciudad Real=2. Cuenca=3. Guadalajara=4 y Toledo=5)

Mortality risk factors: method

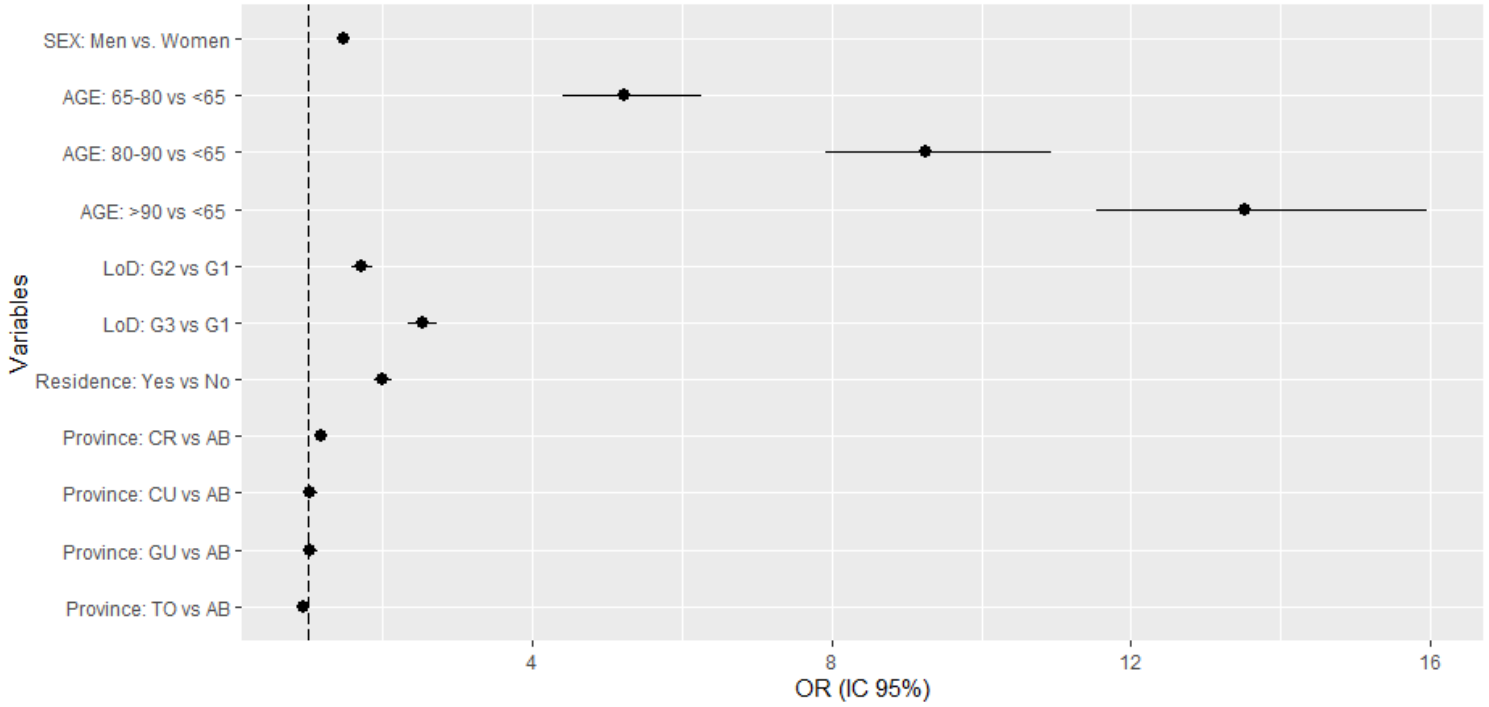
$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 SEX + \beta_2 AGE + \beta_3 DL + \beta_4 NH + \beta_5 PROV + \beta_6 EX + \beta_7 AGE \times EX + \beta_8 DL \times EX + \beta_9 NH \times EX + \beta_{10} PROV \times EX$$

- Multiple logistic regression on combined cohort

- βi is the beta of the variable, βj is the beta of the control variable (exposure) and βi×j is the beta of the interaction. The result of exp(βi) will be interpreted as the effect without exposure of belonging to group vs. the reference category, and exp(βi + βi×j) will be interpreted as the effect with exposure of group vs. the reference category

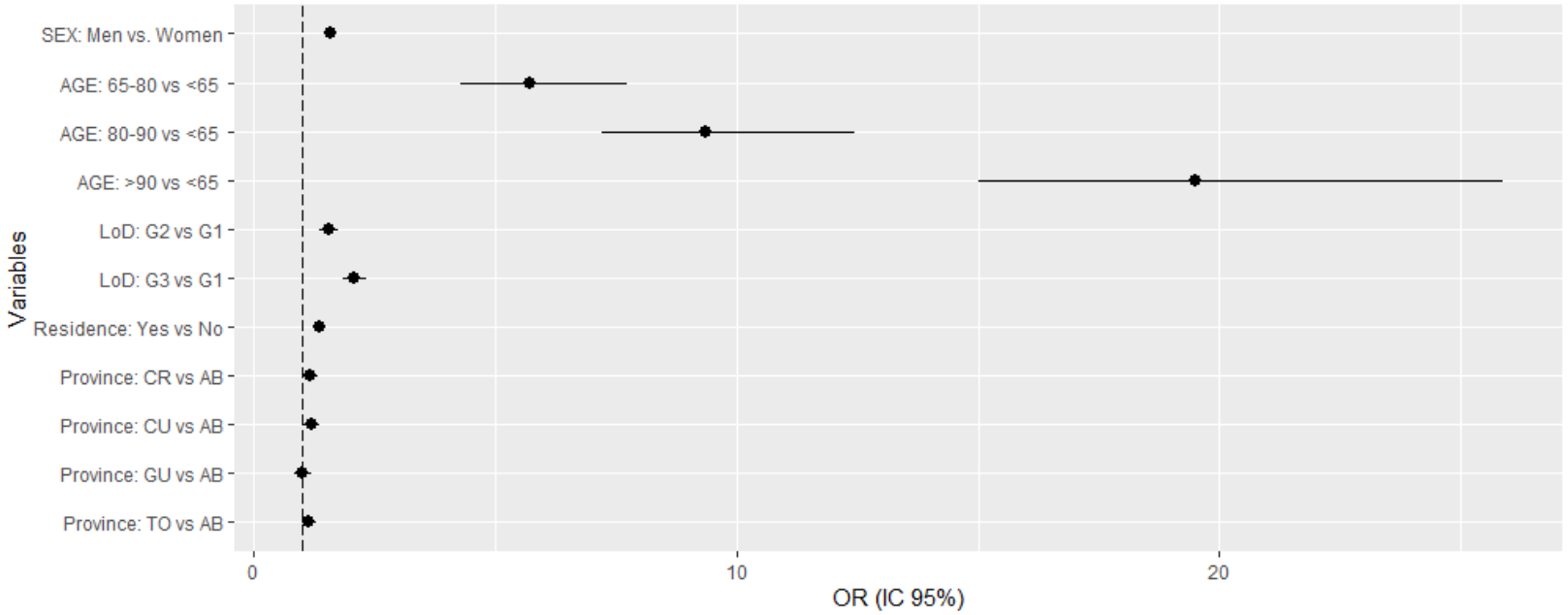
Mortality risk factors: results

Multiple logistic regression analysis: cohort exposed to COVID-19



Mortality risk factors: results

Multiple logistic regression analysis: reference cohort



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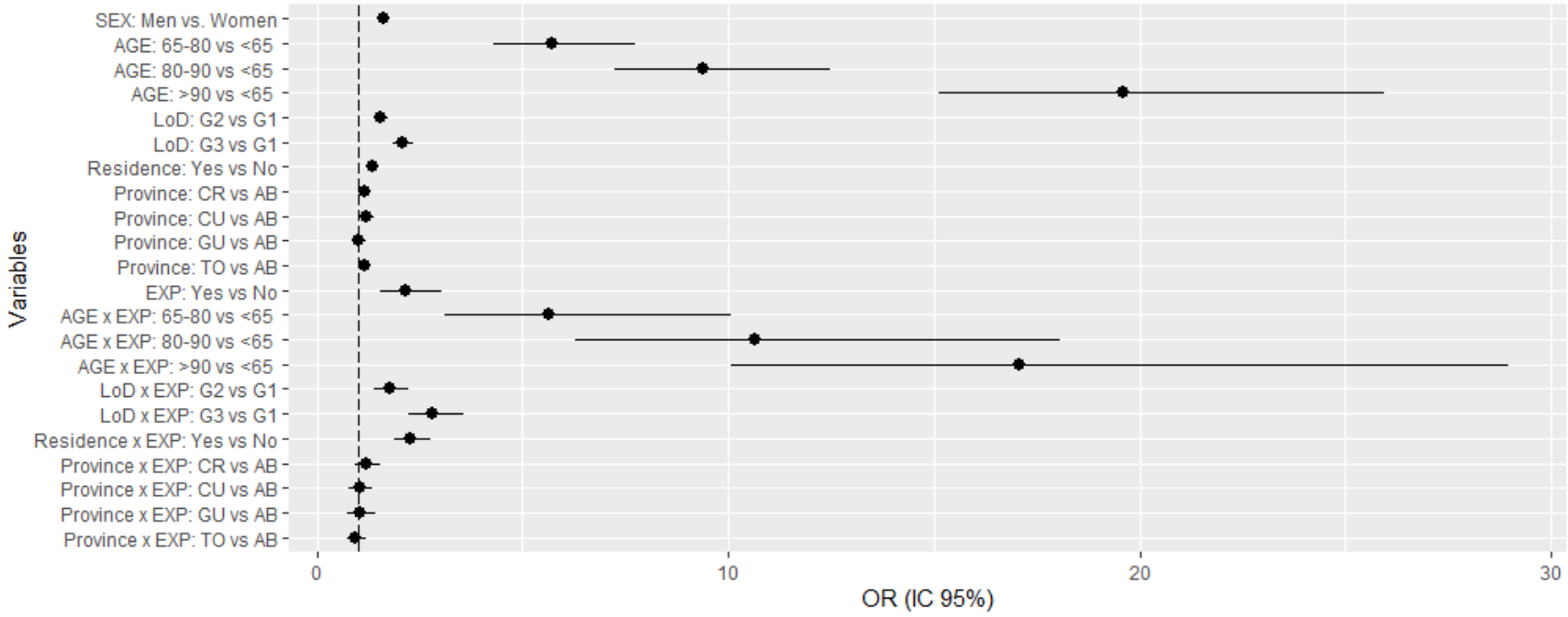
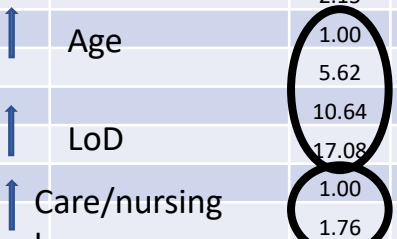
Mortality risk factors: results

Multiple logistic regression analysis: combined cohort



		Exposed cohort		Reference cohort		Combined Cohort	
Variables		OR	IC 95%	OR	IC 95%	OR	IC 95%
Constant		0.004	(0.003; 0.005)	0.0016	(0.0029; 0.0042)	0.0016	(0.0012; 0.0022)
Sex	Female (referencie	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Male	1.48	(1.41; 1.56)	1.59	(1.45; 1.73)	1.61	(1.53; 1.69)
Age	<65	1.00	Ref.	1.00	Ref.	1.00	Ref.
	65-80	5.23	(4.4; 6.25)	5.71	(4.29; 7.74)	5.72	(4.30; 7.75)
	80-90	9.26	(7.91; 10.93)	9.36	Ref.	9.4	(7.23; 12.47)
	>90	13.52	(11.54; 15.96)	19.5	(7.2; 12.44)	19.58	(15.10; 25.95)
Level of dependence	Level 1	1.00	Ref.	1.00	(15.02; 25.86)	1.00	Ref.
	Level 2	1.71	(1.58; 1.85)	1.55	(1.38; 1.75)	1.55	(1.38; 1.75)
	Level 3	2.52	(2.34; 2.72)	2.08	Ref.	2.08	(1.85; 2.34)
Care Home	No (reference)	1.00	Ref.	1.00	(1.85; 2.34)	1.00	Ref.
	Sí	2.00	(1.89; 2.11)	1.37	(1.25; 1.5)	1.37	(1.25; 1.5)
Province	Albacete (reference)	1.00	Ref.	1.00	Ref.	1.00	Ref.
	Ciudad Real	1.17	(1.09; 1.26)	1.18	(1.04; 1.33)	1.18	(1.04; 1.33)
	Cuenca	1.03	(0.95; 1.12)	1.21	(1.05; 1.38)	1.20	(1.05; 1.38)
	Guadalajara	1.02	(0.93; 1.12)	1.01	(0.86; 1.19)	1.01	(0.86; 1.19)
	Toledo	0.93	(0.87; 1.01)	1.15	(1.02; 1.31)	1.16	(1.02; 1.31)
Exposure to COVID-19	No (reference)					1.00	Ref.
	Yes					2.15	(1.53; 3.04)
Age × Exposure	<65					1.00	Ref.
	65-80					5.62	(3.13; 10.09)
	80-90					10.64	(6.27; 18.06)
	>90					17.08	(10.08; 28.97)
Level x Exposure	Level 1					1.00	Ref.
	Level 2					1.76	(1.38; 2.25)
	Level 3					2.82	(2.23; 3.56)
Care Home x Exposure	No (reference)					1.00	Ref.
	Yes					2.29	(1.90; 2.76)
Province x Exposure	Albacete (reference)					1.00	Ref.
	Ciudad Real					1.21	(0.94; 1.56)
	Cuenca					1.03	(0.78; 1.37)
	Guadalajara					1.03	(0.74; 1.43)
	Toledo					0.94	(0.74; 1.2)



Conclusion:

This work is in progress and any suggestions are welcome

Some ideas:

- Excess mortality from weeks 10 to 26 2020 to dependent people was important
- Besides, vulnerable population were more affected, especially over 90 and level dependence III
- Mortality in nursing homes is key information for policy makers. In the pandemic period, the percentage of deaths occurred in these institutions increased to 42%.

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Thanks! (¡Muchas gracias!)

Suggestions

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