

## Addressing vaccination priority by stratifying general population according with frailty: a large population-based cohort study

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## SUPPLEMENTARY MATERIAL

**Supplementary Table S1.** Selected features of regional populations included into the validation study in comparison with entire Italian population

Region	Location	Italian 2020 population census <sup>†</sup>		Indicators of Covid-19 Epidemic Spread (March-December 2020) <sup>‡</sup>	
		Whole population	Population aged	Ascertained cases	Deaths
			18 – 79 years		
Lombardy	Norther Italy	10,027,602	7,663,864	478,903	25,123
Valle d’Aoste	North Italy	125,034	95,914	7,273	379
Marche	Central Italy	1,512,672	1,150,809	41,624	1,571
Puglia	Southern Italy	3,953,305	3,055,720	90,964	2,472
Sicily	Island	4,875,290	3,744,848	93,644	2,412
	Total	20,493,903	15,711,155	712,408	31,957
	Italy	59,641,488	45,788,626	2,107,166	74,159

<sup>†</sup> source: <http://demo.istat.it/popres/index.php?anno=2020&lingua=ita>

<sup>‡</sup> source: Protezione Civile. Dati COVID-19 Italia (available at <https://github.com/pcm-dpc/COVID-19>)

**Supplementary Table S2.** List of candidate conditions for predicting the risk of experiencing severe fatal forms of COVID-19 infection

Diagnostic categories	#	Disease / condition	ICD-9 CM	ATC	
Infectious and parasitic diseases	1	HIV infection	042.x, V08	J05AB14, J05AE, J05AF01, J05AF02, J05AF04, J05AF05, J05AF06, J05AF09, J05AG, J05AR, J05AX07, J05AX08, J05AX09, J05AX12	
	2	Tuberculosis and Other infectious and parasitic diseases	010.x - 018.x, 001.x-009.x, 020.x-027.x, 030.x-041.x, 045.x-057.x, 060.x-066.x, 070.x-088.x, 090.x-104.x, 110.x-118.x, 120.x-139.x	J04AB	
Neoplasms	3	Solid malignancies and Neoplasm of lymphatic and haematopoietic tissue	140.x-165.x, 170.x-176.x, 179.x-199.x, V58.0, 92.2, 200.x-208-x	L01, L03AC, L02BA01, L02BA02, L02BG02, L02BG03, L02BG04, L02BG06, L02BB01, L02BB03, L02AE02, L02AE04, L02AB01	
	4	Benign neoplasm and carcinoma in situ	210.x-234.x		
Endocrine, nutritional and metabolic diseases, and immunity disorders	5	Hypothyroidism	243, 244.x	H03A, H03B	
	6	Hyper e hypoparathyroidism	252.0, 252.1		
	7	Diabetes without insulin therapy	250.x, 348.0x, 357.2, 362.0, 366.41	A10B	
	8	Insulin therapy		A10A	
	9	Dyslipidaemia	272.2, 272.4	C10	
	10	Obesity	278.0x		
	11	Weight loss	260-263.x		
	12	Disorders of fluid, electrolyte, and acid-base balance	276.x		
	13	Gout	274.x	M04AC01, M04AA, M04AB	
	14	Other disorders of endocrine, nutritional and metabolic diseases	240.x-242.x, 245.x, 246.x, 249.x, 251.x, 252.8, 252.9, 253.x-259.x, 264.x-269.x, 270.x, 271.x, 272.0, 272.1, 272.3, 272.5-272.9, 273.x, 275.x, 277.x, 278.1-278.8 (except 277.0)		
	15	Disorders involving the immune mechanisms	279.x		
	Diseases of the blood and blood-forming organs	16	Coagulation defects	286.x	B02B
		17	Autoimmune haemolytic anaemias, Other anaemias, Anaemias only tracked from drug therapy	280.x-282.x, 283.1-283.9, 284.x-285.x	B03A, B03B, B03XA01, L03AA
		18	Other diseases of the blood and blood-forming organs	287.x-289.x	
Mental disorders	19	Dementia / Alzheimer	290.0-290.4x, 331.0x	N06DA, N06DX01	

	20	Psychosis	295.x, 297.x, 298.2-298.9, 299.1x	N05AD, N05AA, N05AB, N05AC, N05AX, N05AE, N05AF, N05AG, N05AH, N05AL
	21	Depression	296.2, 296.3, 296.82, 298.0, 300.4, 301.12, 309.0x, 309.1x, 311.x	N06A
	22	Bipolar disorders	296.0x, 296.1x, 296.4x, 296.5x, 296.6x, 296.7x, 296.80, 296.81, 296.89, 296.9x, 298.1x	N05AN
	23	Alcohol abuse	291.1, 291.2, 291.5, 291.8x, 291.9, 303.9, 305.0x, V11.3x	N07BB01
	24	Drug addiction	292.0x, 292.82-292.89, 292.9x, 304.x, 305.2x-305.9x	N07BB04
	25	Anxiety	300.0x	N05BA, N05BB01, N05CD, N05BC01, N05BC51, N05BX, N05CF, N05CX01, N06BX
	26	Other mental disorders	290.8, 290.9, 291.0, 291.3, 291.4, 292.1x, 292.2, 292.81, 293.x, 294.x, 299.0x, 299.8x, 299.9x, 300.0x-300.2x, 300.3, 300.5-300.9, 301.0, 301.10, 301.11, 301.2x-301.9x, 302.x, 303.x, 305.1, 306.x-308.x, 309.2x-309.4x, 310.x, 312.x-319.x	
Diseases of the nervous system and sense organs	27	Parkinson's disease and parkinsonism	332.x	N04
	28	Multiple sclerosis	340	L03AB07, L03AB08, L04AA23, L04AA27, L03AX13, L04AA31, L04AA34, L03AB13, L04AX07
	29	Epilepsy and recurrent seizures	345.x	N03AF01, N03AB02, N03AA02, N03AA03, N03AA04, N03AE01, N03AD01, N03AG01, N05BA09, N03AG04, N03AX10, N03AG06, N03AF02, N03AX14, N03AX15
	30	Glaucoma	365.x	S01E
	31	Disorders of the eye and adnexa	360.x-379.x (except 365.x)	
	32	Diseases of the ear and mastoid process	380.x-389.x	
	33	Other diseases of the nervous system and sense organs	320.x-326.x, 330.x-331.x, 333.x-337.x, 340.x-344.x, 346.x-359.x	
Diseases of the circulatory system	34	Ischaemic Heart Disease/Angina	410.x – 414	C01DA, C01DX
	35	Heart failure	398.91, 402.11, 402.91, 404.11, 404.13, 404.91, 404.93, 428.x	
	36	Arrhythmia	426.10, 426.11, 426.13, 426.20-426.53, 426.60-426.89, 427.0, 427.2,	C01BA, C01BC, C01BD

		427.31, 427.60, 427.9, 785.0x, V45.0x, V53.3x	
	37	Valvular diseases	093.20-093.24, 394.0x-397.1x, 424.00-424.91, 746.3x-746.6x, V42.2x, V43.3x
	38	Vascular diseases	440.x, 441.2, 441.4, 441.7, 441.9, 443.1x-443.9x, 447.1, 557.1x, 557.9x, 785.4x, V43.4x
	39	Cerebrovascular diseases	430.x-438.x
	40	Hypertension	401.x-405.x
			C03AA, C03AB, C03AH, C03AX01, C02CA04, C03BA02, C03BA03, C03BA04, C03BA05, C03BA07, C03BA08, C03BA09, C03BA10, C03BA11, C03DB01, C03DB02, C03EA, C09BA02, C09BA03, C09BA04, C09BA05, C09BA06, C09BA07, C09BA08, C09BA09, C09BB, C09DB, C09DA01, C09DA02, C09DA03, C09DA04, C09DA06, C09DA07, C09DA08, C02AB01, C02AB02, C02AC01, C02AC02, C02AC04, C02AC05, C02DB02, C02DB03, C02DB04, C02DC01, C02DD01, C02DG01, C02KA01, C02KB01, C02KC01, C02KD01, C02KX01, C09XA B01AB, B01AX01, B01AD10, B01AD12, C04AD03, B01AC05 B01AA, B01AE, B01AF
	41	Coronary and peripheral vascular disease	
	42	Oral anticoagulant agents	
	43	Other diseases of the circulatory system	390.x-392.x, 393, 397.9, 398.90, 398.99, 411.8x, 412.x-417x, 420.x-423.x, 424.99, 425.x, 426.0, 426.12, 426.54, 426.9, 427.1, 427.32, 427.4x, 427.5, 427.61, 427.69, 427.8x, 429.x, 441.0x, 441.1, 441.3, 441.5, 441.6, 442.x, 443.0, 444.x-446.x, 447.0, 447.2-447.9, 448.x 451.x-459.x
Diseases of the respiratory system	44	Chronic Obstructive Pulmonary Disease, Asthma, Chronic respiratory disease only tracked from drug therapy	490-492.x, 493.x, 494.x, 496 R03AA, R03AB, R03AC, R03DA, R03DB, R03DA20, R01AC01, R03BC01, R01AC51, S01GX01, S01GX51, R03BA

	45	Acute respiratory infections	460-466.x	
	46	Cystic Fibrosis	277.0	R05CB, R05FB01, R05FA01, A09AA02, R07AX02, R07AX30, R07AX31
	47	Other diseases of the respiratory system	470.x-478.x, 480.x-487.x, 495.x, 500.x-508.x, 510.x-519.x	
Diseases of the digestive system	48	Liver cirrhosis and other liver chronic diseases	571.x, 573.x	J05AP08, J05AP09, J05AP51, J05AP53, J05AP54, J05AP55, J05AP56, J05AP57, B05AA01
	49	Inflammatory bowel diseases (Ulcerative colitis and Chron's disease)	555.x-556.x	A07EC01, A07EC02, A07EC03, A07EC04
	50	Chronic and acute pancreatitis	577.0-577.1	
	51	Other diseases of the digestive system	520.x-553.x, 557.x-570, 572.x, 574.x-576.x, 577.2-577.9, 578.x, 579.x	
Diseases of the genitourinary system	52	Chronic kidney disease	585, V45.1, V56.x, V03AE	
	53	Other kidney disorders	580.x-584.x, 586, 587, 588.x-589.x	
	54	Other diseases of the genitourinary system	590.x-608.x, 610.x, 611.x, 614.x-629.x	
Diseases of the skin and subcutaneous tissues	55	Diseases of the skin and subcutaneous tissues, including No rheumatoid psoriasis	680.x-686.x, 690.x-695.x, 696.0, 696.2-696.5, 696.8, 697.x, 698.x, 700.x-709.x, 696.1	D05BB01, D05BB02, D05AX
Diseases of the musculoskeletal system and connective tissue	56	Autoimmune disease (Rheumatoid arthritis, Rheumatoid psoriasis, Anchylosing spondylitis, Systemic sclerosis, Systemic lupus erythematosus)	714.0, 696.0, 720.0, 710.1x, 710.0x	
	57	Other diseases of the musculoskeletal system and connective tissue	710.2-710.9, 711.x-713.x, 714.1x, 714.9x, 715.x-719.x, 720.1x-720.9x, 721.x-739.x	
Symptoms, signs and ill-defined conditions	58	Symptoms, signs and ill-defined conditions	780-799	
Other conditions	59	Transplantation	V42	L04AA01, L04AA02, L04AA03, L04AA04, L04AA05, L04AA06, L04AA08, L04AA09, L04AA10, L04AA11, L04AA12, L04AA14, L04AA15, L04AA16, L04AA17, L04AA18, L04AA19, L04AA21, L04AD01, L04AD02, L04AX01

60	Chronic pain	338.2, 338.4	N02AA01, N02AG01, N02AE01, N02AB03, N02AA05, N02AA55, N02AA03, N02AX06
61	Corticosteroids		H02