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Cov19 in Italy: Correlation with Clinical, Demographical, Social Variables, and Water

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ABSTRACT

Background: *The cov19 is a very serious problem in most of the developed countries.*

Material and Methods: *The data of positive cases and deaths due to Cov19 from March 1st to April 22nd in Italy were retrieved from the official documents released by the Department of the Italian Protezione Civile. The curves of the growth were analyzed both in terms of crude numbers and differential values among days. The data were correlated with clinical, demographical, social variables, and water (rivers linear Km, and domestic consumption) retrieved from public records.*

Results: *Cov19 is affecting the most productive areas of Italy, particularly in the Northen territories. The average values of symptomatic positive cases and deaths in the period were respectively 2.6 % and 0.021 %, while the ratio between positive case and death was 13.8 %. The pick of the curves was reached approximately 3-4 weeks after the appearance of the first symptomatic cases, and their declining over time seems to be asymptotic.*

No correlation was found with aging, cardiovascular diseases, diabetes and smoke, though Cov19 seems to behave as an independent disease. Significant correlations were shown with cars/1000 inhabitants and number of buses for public transportation. A very high correlation was found with Km of rivers in the regional territories and the domestic water consumption.

Conclusion: *Cov19 is affecting particularly the most prosperous Italian Regions, were the high interaction among people is the common life style. The disease bound to the virus behaves as an independent disease and aging, smoking or chronic diseases did not show to have a relevant impact. The lockdown was effective, but the water pollution, in terms of viral spreading, is still an overt problem to be solved.*

The differences of the Cov19 impact on the Regions suggest to focus the resources mainly in those were the viral infection was violent.

Keywords

Coronavirus, Clinical condition, Diabetes, Cardiovascular diseases, Smoking, Demographic variables, Social variables, Water pollution.

Introduction

As already reported for the month of March [1], the problem of Cov19 infection in Italy was one of the most dramatic when compared to the other countries affected by this virus.

The data showed that Cov19 was particularly aggressive in the most prosperous Italian Regions of the North, while in the Regions of the Centre (a part of Marche) and South of Italy or Islands, it was apparently much less violent. Positive correlations were found between the number of cases affected and the population density, the GDP (Gross Domestic Product), and the number of inhabitants living in flat lands, while no correlation was found in the case of people living on hills or with the temperature and rainfall.

The aim of the present study was to analyze the correlations between Cov19 and other clinical, demographical, social variable considering also water (in terms of linear Km of rivers, and domestic use consumption). The period considered was between March 1st and April 22nd.

Material and Methods

The data of the Cov19 positive cases and deaths - due or presumably due to the viral infection- were drawn from the daily Official Bulletin publically released by the Department of the Italian Protezione Civile [2];
the demographical variables (population, density/Km^2, life expectancy) were taken by Tuttitalia.it [3];
the GDP and diabetes was taken from True numbers.it 2020 publication [4];
Cardiovascular diseases were retrieved from specific mortality indexes [5]
Old age indexes were taken from Adminstat Italia [6];
Data concerning the water consumption were taken from Mondonhonline [7];
the length, the route, and territories of the main Italian rivers were taken from Wikipedia [8];
the cells traffic phone was taken by iphoneitalia [9];
the number of vehicles (cars and bus) was retrieved from Statistiche Comuni-Italiani [10] ;
Data concerning smoking were retrieved from Fumo [11];
Data relative to deaths were taken from the last publically available records of ISAT 2018 [12].

Statistical methods

The averages and SD were calculated for all variables. For the correlations among variables the values of "r" were calculated using $p < 0.05$ as cut-off (0.444) for the statistical significance. This simple method was found more severe that the relative correction trough Robust Regression [13,14] which was not reported.

Results

Coronavirus positive tests

The number of positive oropharynx swabs (OPS)/Region, and deaths from March 1st up to April 22nd are reported in Table 1.

Region	Inhab N x 10^3	OPS N	OPS % Inab	OPS Positive N	OPS % Positive	OPS % Positive /Inhab	Deaths N	Part of Italy
Lom	10.02	290699	2.90	**69092**	23.8	6.90	**12740**	North
Laz	5.90	104602	1.77	**5975**	5.7	1.01	**370**	Center
Cam	5.84	55701	0.95	**4185**	7.5	0.72	**327**	South
Sic	5.06	58732	1.16	**2883**	4.9	0.57	**208**	Island
Ven	4.91	277543	5.66	**16738**	6.0	3.41	**1181**	North
EmR	4.45	140847	3.17	**23434**	16.6	5.27	**3204**	North
Pie	4.39	111513	2.54	**22739**	20.4	5.18	**2559**	North
Pug	4.06	48342	1.19	**3730**	7.7	0.92	**362**	South
Tos	3.74	114100	3.05	**8700**	7.6	2.32	**705**	Center
Cal	1.97	26560	1.35	**1060**	4.0	0.54	**76**	South
Sar	1.65	18886	1.02	**1247**	7.4	0.75	**96**	Island
Lig	1.57	35900	2.29	**6918**	19.2	4.42	**1022**	North
Mar	1.53	46492	3.02	**5924**	12.7	3.85	**845**	Center
Abr	1.32	30348	2.30	**2733**	9.0	2.07	**276**	Center
FVG	1.22	50896	4.18	**2817**	5.5	2.31	**246**	North
TAA	1.06	59396	5.59	**6062**	10.2	5.70	**637**	North
Umb	0.89	27655	3.11	**1357**	4.9	1.53	**61**	Center
Bas	0.57	8040	1.41	**354**	4.4	0.62	**24**	South
Mol	0.31	4425	1.43	**284**	6.4	0.91	**19**	South
VdA	0.12	5024	3.96	**1095**	21.8	8.83	**128**	North
Total	60.59	15136198		**187327**			**25085**	
Mean ± SD			2.602 ± 1.4169		10.30 ± 6.421	2.60 ± 1.417		
r OPS Vs positive cases = 0.8222 $p < 0.01$; r OPS Vs deaths = 0.7298 $p < 0.01$								

Table 1: Cov19 positive cases to the oropharynx swabs/Region, and deaths: from March 1st up to April 22nd.

Legenda: Lom =Lombardia; Laz = Lazio; Cam = Campania; Sic = Sicilia; Ven = Veneto; EmR = Emilia Romagna; Pie = Piemonte; Pug = Puglia; Tos = Toscana; Cal = Calabria ; Sardegna; Lig = Liguria; Mar = Marche; Abr = Abruzzo; FVG = Friuli Venezia Giulia; TAA = Trentino Alto Adige; Umb = Umbria; Bas = Basilicata; Mol = Molise: VdA = Val d'Aosta; OPS= oropharyngeal swabs; Inhab = inhabitants.

The values of OPS and OPS % positive cases depend on the number of subjects who were analyzed according to the Regional policy: in some of the Regions, only symptomatic patients were controlled, while in some others the control was done also in subjects with no symptoms or because they had contacts with positive subjects. In few cases was undertaken as a personal initiative.

Data concerning positive cases consist of 10.3 % of the population and mirror the deaths which was the consequence in 13.4% of the patients.

The death % is very different among Regions, depending upon the number of patients approaching hospitals, particularly the emergency rooms. However, many patients died at home, and some of them most probably was not listed in the death records. This means that the values may represent the "pick iceberg" only.

The differences among Regions is quite evident, ranging from a dramatic situation in the Northern Regions to a more affordable condition in the Central, Southern Regions, and Islands, a part of Marche and Toscana where the picture was more similar to the Regions of the North.

The Cov19 positive tests in the different Regions are reported in Table 2 and 3, as retrieved from the official documents [2], and were divided according to the number of inhabitants in the Regions (> 1.97 million and < 1.97 million).

Region	Lom	Laz	Cam	Sic	Ven	EmR	Pie	Pug	Tos	Cal
Inhab	10.02	5.90	5.84	5.06	4.91	4.45	4.39	4.06	3.74	1.97
March										
1	984	6	17	9	263	285	49	3	13	1
3	1520	14	30	7	307	420	56	6	19	1
5	2251	44	45	18	407	698	108	14	61	2
7	3420	76	61	35	543	1010	207	26	113	4
9	5469	94	102	54	744	1386	350	50	208	11
11	7280	150	154	83	1023	1739	501	77	320	19
13	9820	277	220	130	1595	2263	840	129	470	38
15	13272	436	333	188	2172	3093	1111	230	781	68
17	16220	607	460	237	2704	3931	1879	340	1053	114
19	19884	823	652	340	3484	5214	2932	478	1482	169
21	25515	1190	844	490	4617	6705	3572	675	2012	235
23	28761	1540	1026	721	5505	8535	4861	906	2461	292
25	32346	1901	1199	994	6442	10054	6024	1093	2972	351
27	37298	2295	1454	1250	7497	11588	7092	1334	3450	494
29	41007	2706	1759	1460	8358	13119	8206	1549	4122	614
31	43208	3095	2092	1647	9155	14074	9301	1803	4608	659
April										
2	46065	3433	2456	1791	10111	15333	10353	2077	5273	691
4	49118	3757	2828	1932	10824	16540	11709	2240	5671	741
6	51534	4031	3058	2046	11588	17556	12924	2444	6001	817
8	53414	4266	3268	2159	12410	18234	18883	2646	6379	859
10	56048	4583	3442	2302	13421	19128	15012	2809	6727	901
12	59052	4845	3604	2416	14077	20098	16660	2989	7235	923
14	61326	5111	3769	2501	14432	20752	17690	3118	7526	956
16	63094	5380	3887	2579	14990	21486	19108	3258	7943	1009
18	65381	5668	3988	2672	15692	22184	20464	3409	8237	1011
20	66971	5815	4074	2759	16127	22867	21349	3567	8507	1038
22	69092	5957	4185	2883	16738	23434	22739	3730	8700	1060

Table 2: Number of Cov19 positive cases from March 1st up to April 22nd: Italian Regions with >1.97 million of inhabitants.
Legenda: see Table 1.

Region	Sar	Lig	Mar	Abr	FVG	TAA	Umb	Bas	Mol	VdA
Inhab	1.65	1.57	1.53	1.32	1.22	1.06	0.89	0.57	0.31	0.13
March										
1	0	25	25	5	6	1	2	0	0	0
3	1	24	61	6	13	5	8	1	3	0
5	2	28	124	8	22	7	9	1	7	2
7	5	51	207	11	42	23	24	3	14	8
9	19	109	323	30	93	42	28	5	14	15
11	37	194	479	38	126	152	46	8	16	20
13	43	345	725	89	257	288	76	10	17	28
15	77	559	1133	137	347	582	153	11	17	57
17	117	778	1371	229	394	676	197	20	25	136
19	206	1059	1737	385	599	959	334	37	46	215
21	330	1436	2153	529	790	1403	462	66	61	313
23	359	1924	2596	663	930	1747	577	90	67	393
25	442	2305	2934	813	1139	2080	710	113	73	401
27	530	2696	3196	1017	1317	2394	884	151	109	452
29	638	3076	3558	1293	1480	2808	1023	202	127	584
31	772	3416	3825	1041	1593	3117	1078	226	144	628
April										
2	794	3782	4098	1497	1799	3482	1128	246	165	88
4	874	4203	4341	1628	1986	3812	1210	264	206	748
6	922	4549	4614	1721	2103	4070	1253	287	224	805
8	975	4909	4859	1859	2218	4437	1289	297	226	850
10	1063	5191	5084	2014	2349	4711	1302	308	243	879
12	1113	5494	5303	2160	2431	5151	1319	315	257	921
14	1138	5808	5426	2245	2520	5325	1321	319	257	947
16	1164	6039	5528	2346	2616	5561	1329	336	263	971
18	1198	6301	5721	2487	2731	5756	1344	339	269	1073
20	1228	6669	5828	2612	2775	5984	1349	342	281	1088
22	1247	6918	5924	2733	2817	6062	1357	354	284	1095

Table 3: Number of Cov19 positive cases from March1st to April 22nd: Italian Regions with < 1.97 million of inhabitants.
Legenda: see Table 1.

The figures pertaining to the number of positive cases and the relative differential value (Day Xn- Day Xn-1) are reported in Figure 1 and 2. The data in the Figures are presented as daily data, and not as every other day as for the Table 1 and 2 values. This allows to better realize the fluctuation of the curves.

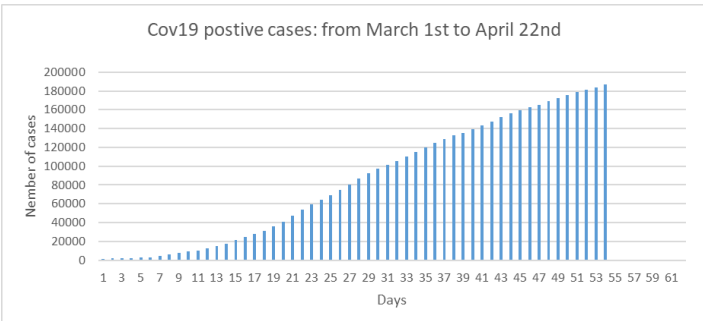

Figure 1: Distribution of the number of Cov19 positive cases from March 1st to April 22nd: 1= March 1st; 54 = April 22nd.

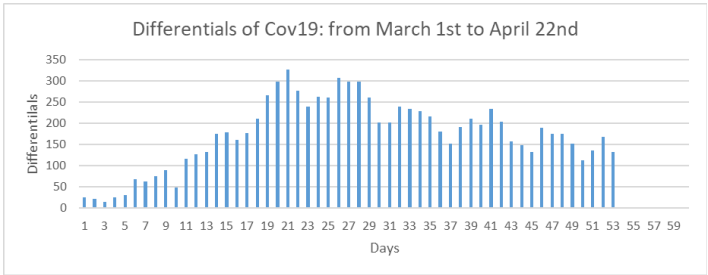

Figure 2: Distribution of the differential's values (day Xn- day Xn-1) of Cov19 positive cases from March 1st and April 22nd: 1= March 1st; 53 = April 22nd.

The pick was reached at March 21st. The projection of the curve can be asymptotic; it means that will be very hard to reach the value of "zero", and hopefully a value around 50 cases/day in the month of June can be estimated.

No correlation was found between positive cases/1000 inhabitants and the total population in the Regions (r= 0.1093 p> 0.05).

Death with/for Cov19

The issue of deaths due to the Cov19 pneumonia is still equivocal, since most of the cases were also affected by one or more diseases and with age > 60 years [1]. The analysis was considering the deaths as for the official records [2]; they are reported in Tables 4 and 5 in relation to the Region with > 1.97 million and < 1.97 million of inhabitants.

Re-gion	Lom	Laz	Cam	Sic	Ven	EmR	Pie	Pug	Tos	Cal
Inhab	10.02	5.90	5.84	5.06	4.91	4.45	4.39	4.06	3.74	1.97
March										
1	31	2	2	0	2	4	0	0	0	0
3	52	0	3	0	4	19	0	0	0	0
5	96	0	0	0	10	30	2	1	0	0
7	233	1	0	0	13	48	5	0	0	0
9	333	5	0	2	20	70	13	0	1	1
11	617	6	1	0	29	113	23	5	1	0
13	890	11	2	2	42	201	46	5	5	0
15	1218	16	9	2	63	284	81	16	8	1
17	1640	23	9	3	80	393	133	18	17	1
19	2168	38	17	4	115	531	175	25	38	3
21	3095	50	22	6	146	715	238	29	72	5
23	3776	63	49	13	192	892	315	37	109	7
25	4474	95	74	25	258	1077	449	48	142	11
27	5402	118	98	39	313	1267	569	69	177	18
29	6360	136	117	65	392	1443	684	86	215	25
31	7199	162	133	81	477	1644	854	110	244	36
April										
2	7960	185	167	93	532	1811	983	144	268	41
4	8556	212	186	111	607	1977	1128	173	307	49
6	9202	229	204	123	662	2108	1251	195	350	58
8	9722	244	221	133	736	2234	1378	219	392	60
10	10238	263	231	148	793	2397	1532	238	454	65
12	10621	279	242	163	856	2564	1729	260	495	66
14	11142	300	260	175	906	2705	1927	278	538	68
16	11608	316	286	187	981	2834	2094	299	585	72
18	12050	340	300	196	1059	2965	2252	314	618	124
20	12376	349	309	203	1112	3079	2409	326	667	75
22	12740	370	327	208	1181	3204	2559	362	705	76
Total March	7176	160	131	81	477	1644	854	110	244	36

Table 4: Number of deaths due to Cov19 and/or concomitant diseases from March 1st up to April 22nd: Italian Regions with >1.97 million inhabitants: Legenda: see Table 1.

Region	Sar	Lig	Mar	Abr	F VG	TAA	Umb	Bas	Mol	VdA
inhab	1.65	1.57	1.53	1.32	1.22	1.06	0.89	0.57	0.31	0.13
March										
1	0	0	0	0	0	1	0	0	0	0
3	0	0	0	0	0	5	0	0	0	0
5	0	1	6	0	0	7	0	0	0	0
7	0	3	6	0	0	23	0	0	0	0
9	0	6	10	0	1	42	0	0	0	0
11	0	8	18	1	6	0	0	0	0	1
13	0	17	27	2	10	4	1	0	0	1

15	2	33	46	3	14	11	1	0	0	1
17	2	60	69	6	30	15	1	0	1	2
19	2	91	115	11	36	26	2	0	2	6
21	4	152	154	22	42	48	10	0	7	8
23	11	212	203	38	54	70	16	1	7	12
25	18	254	287	52	70	117	19	1	8	24
27	21	331	336	68	76	162	21	3	9	37
29	27	377	386	88	98	193	31	4	9	43
31	31	428	452	115	113	240	37	7	9	56
April										
2	40	488	503	133	129	316	38	10	11	63
4	41	542	574	153	145	356	41	11	11	82
6	47	595	612	169	158	394	44	13	13	96
8	59	654	652	179	169	438	50	14	13	226
10	69	709	682	198	179	466	52	15	13	107
12	73	749	700	212	195	498	52	18	15	112
14	80	793	728	232	206	524	53	19	15	118
16	85	828	764	243	217	574	55	22	16	122
18	86	897	795	253	222	587	57	23	16	124
20	86	957	822	263	239	615	58	24	18	127
22	96	1022	845	276	246	637	61	24	19	127

Table 5: Number of deaths due to Cov19 and/or concomitant diseases from March 1st to April 22nd: Italian Regions with < 1.97 million inhabitants. Legenda: see Table 1.

The figures pwertaining to the deaths and the relative differential value (Day X_{n-} Day X_{n-1}) are reported in Figure 3 and 4. The data in the Figures are presented as daily data, and not every other day as for Tables 3 and 4 values. This allows to better realize the fluctuation of the curves.

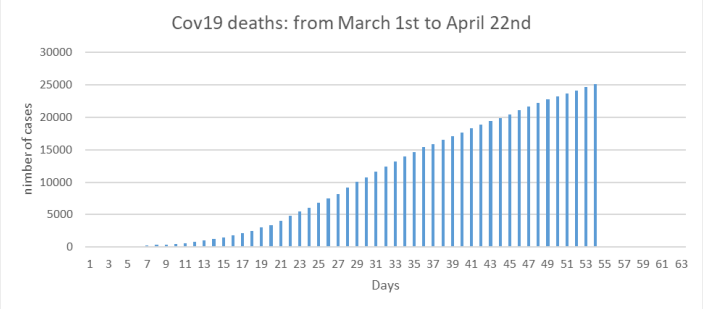

Figure 3: Distribution of deaths due to or with Cov19 from March 1st to April 22nd: 1= March 1st; 54 = April 22nd.

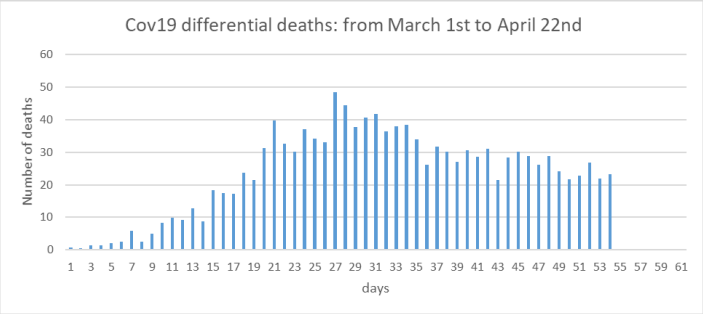

Figure 4: Distribution of the differential's values (day X_{n-} day X_{n-1}) of Cov19 deaths from March 1st to April 22nd: 1= March 1st; 53 = April 22rd. The increase in April 22nd (point 54 in the figure) over April 21st (point 53 in the figure) was 1.018.

In the case of deaths, pick was reached at March 27th. The projection of the curve can be asymptotic; it means that will be very hard to reach the value of "zero", and hopefully a values around 5 cases/day in the month of June can be estimated, only in case the ratio deaths/symptomatic case will remain = 13.8 %.

No correlation was found between death/1000 inhabitants and the total population in the Regions (r = 0.2676 p >0.05).

Among deaths, those for pneumonia were dramatically increased in Lombardia (34 times more than usual as already reported [1]) and around 8 to 10 times higher than those registered in the other Regions of Italy. Much lower increases were found in other regions (Emilia Romagna, Piemonte, Liguria, Marche, and Trentino Alto Adige), creating also problems to the emergency rooms. For the other Regions of the South and Islands, the figures were much lower.

Demographic/social/environmental variables of Cov19

The Cov19 evolution was considered on the light of different variables such as the total population in the different Regions: the cell phones traffic; internet connections %; numbers of cars/1000 people; number of buses for transportation. The domestic water consumption and the km of main rivers were also analyzed. These data are reported in Table 6.

Region	Inhab X 10^6 2019	Cell Phones Minutes 2020	Internet % connection 2020	Cars/1000 Inhab 2016	Busses/ 1000 Inhab 2020	Water L/day/Inhab 2011 [number cities]	Main Rivers Km
Lom	10.02	591	75.5	1173	10671	321 [14]	1620
Laz	5.90	594	74.6	633	11635	165 [5]	332
Cam	5.84	598	70.5	580	10084	155 [3]	496
Sic	5.06	569	66.9	635	7384	161 [8]	467
Ven	4.91	576	73.3	623	6931	160 [3]	1093
EmR	4.45	555	73.8	631	6002	152 [9]	1014
Pie	4.39	555	70.1	656	5993	174 [5]	1085
Pug	4.06	546	66.6	565	7018	133 [3]	244
Tos	3.74	633	71.2	655	5577	133 [3]	739
Cal	1.97	586	64.2	630	4848	221 [2]	91
Sar	1.65	593	70.5	619	3254	158 [5]	529
Lig	1.57	534	71.9	532	2490	163 [4]	309
Mar	1.53	476	75.2	653	2726	148 [6]	394
Abr	1.32	683	71.8	649	3241	167 [3]	463
FVG	1.22	455	70.0	642	1592	165 [3]	334
TAA	1.06	612	75.7	900	2349	162 [2]	668
Umb	0.89	449	69.4	701	1798	285 [1]	181
Bas	0.57	456	660	641	1919	153 [2]	390
Mol	0.31	425	66.0	667	1138	155 [2]	251
VdA	0.13	400	67.7	1170	348	185 [1]	84
Total	60.59						
M ± SD		544.3 ± 76.04	70.7 ± 16.17	697.8 ± 176.66	4889 ± 3394.6	175.8 ± 47.52	537 ± 392.24
r Vs Positive		-0.1318	***0.7178***	***0.7375***	-0.2539	0.3634	***0.4443***
r Vs Death		-0.0676	***0.6521***	***0.7241***	***-0.4412***	***0.5956***	***0.5520***

Table 6: Demographic/social variables in the Italian Regions and year of recording. Values in bold characters = r p <0.05.
Legenda. See Table 1. Considering the rivers in relation to the territory surface the correlation remains almost identical.

No correlation was found with cell phones, while positive correlation were shown for all the other variables with deaths due to Cov 19. The correlation with positive cases were limited to internet, cars and rivers.

The measures of the age's indexes, life expectancy, prevalence of subjects suffering from cardiovascular disease (CVDs including hypertension and ischemic heart disease) and diabetes, % of people smoking are reported in Table 7.

Region	Inhab X 10^6	Old age index[a] 2020	LE[b] Years 2020	CVDs Prevalence 2019	Diabetes Prevalence 2020	Smoking % 2019
Lom	10.02	165.5	81.4	430.8	4.4	24.0
Laz	5.90	162.6	81.0	461.9	6.1	28.4
Cam	5.84	129.8	81.0	538.1	5.9	26.8
Sic	5.06	153.7	79.9	493.5	5.9	28.0
Ven	4.91	172.1	81.5	429.9	4.0	22.4
EmR	4.45	182.6	81.3	431.3	4.7	27.5
Pie	4.39	205.9	80.7	462.2	3.8	24.1
Pug	4.06	168.6	81.1	447.9	5.4	25.4
Tos	3.74	204.6	81.4	431.1	4.2	24.4
Cal	1.97	163.3	80.1	470.3	7.6	23.2
Sar	1.65	212.0	80.4	456.1	4.9	25.4
Lig	1.57	255.8	80.8	469.2	3.3	26.1
Mar	1.53	196.2	81.6	418.8	3.7	23,9
Abr	1.32	191.8	81.0	453.8	5.2	27.9
FVG	1.22	217.2	81.3	461.2	3.9	24.8
TAA	1.06	138.5	82.0	410.2	3.3	23.4

Umb	0.89	204.2	81,9	425.2	5.4	29.4
Bas	0.57	193.2	80.2	455.9	6.5	21.7
Mol	0.31	217.5	80.3	448.7	4.0	28.8
VdA	0.13	181.6	79.6	446.2	3.8	25.2
Total	60.59					
M ± SD		185.84 ± 30.126	80.93 ± 0.666	452.12 ± 28.581	4.80 ± 1.171	25.54 ± 2.235
r Vs Positives		-0.0304	0.1389	-0.4456	***-0.6648***	-0.2603
r Vs Deaths		0.0509	0.1384	-0.3806	***-0.5851***	-0.2408

Table 7: Aging variables and some chronic disease, diabetes, and % of smoking in the Italian Regions: the year of recording is also reported. Values in bold characters = r p <0.05.
a= Ratio between inhabitants >65 years and inhabitants up to 60 years; b= Life expectancy; for other data see Table 1.

No significant positive correlations were found between positive cases or death for any of the variables. The negative correlations indicate opposite trends between Cov19 and the disease.

Discussion

The data reported in the present evaluation represent the trends of the Cov19 in the Italian Regions from March 1st and April 22nd in comparison to some ecological/demographical/economical/social variables. For of some of the variables the data were relative to previous years, as the domestic use of water (year 2011), and cars/1000 inhabitants (year 2016). However, all variables are highly correlated during time, and despite they were relative to previous years, in terms of correlation with Cov19 in 2020 they are all sufficiently reliable. The data discussion will follow considering the more important points.

Cov19 positive cases and deaths and comorbidity

The lack of correlation between the positive cases or deaths with the number of inhabitants means that for the progression of the Cov19 in the different Region other factors are more determinant that the number of people leaving in a given territory.

The pick of positive cases was reached in March 21st and the daily increase as for April 22nd was 1.018, which means that at the date the viral spreading was still slowly increasing. The curve of the cases is declining very slowly over time, with a shape that seems asymptotic, with "waves" characterized by a period of 4 to 6 days, which can be interpreted as the time needed from the infection to the swab positivity. The number of positive cases was directly correlated with the number of swabs taken ($r= 0.8222$ $p< 0.01$), and the same was for deaths ($r = 0.7298$ $p< 0.01$). This stands for the necessity to make a meticulous screening to determine the real number of people infected with Cov19.

The current opinion of virologists is that the positive cases which has been recorded represent between 1/10 to 1/8 of the population, though the real cases in Italy could be at the moment about 7 million people (> 10% of all the inhabitants). The deaths reached the pick at March 27th, and similarly to the positive cases they decline very slowly with a shape that seems asymptotic. Deaths may be incorrect (for Cov19 or with Cov19, death at home and not recorded) and for the moment represent about 0.021 % of the total Italian population (12,740/60.59 million).

Based upon the ISTAT mortality data of 2018, in 54 days (which is the period considered in the present analysis) for people >50 years deaths were reported to be approximately 73,000 [12]. This indicates that the deaths due to Cov19 (up to April 22nd) represent about the 17 % of the total mortality. It means that Cov19 is a real problem and the swabs, or better the antibodies determinations, are becoming urgent to face this disease, despite the clinical tools are improving day by day.

The use of different drugs to face the infection is underway, but the matter of risk benefit ratio is not yet properly established. More attention should be addressed to the local aerosol, which may allow the use of lower amount of drugs by passing the organs toxicity (liver, kidney, heart).

Still the real issue is prevention, which can be faced with aerosol using natural antiviral (eucalyptol or similar terpenes) [15,16], taking into account that high temperature (< 42-45 °C) per se make the virus less aggressive.

Aging and gender

It was supposed that Cov19 was much more frequent in elderly people also because they may be affected by other chronic diseases and under therapy, most of the time with more than one drug. In relation to the age our data do not confirm this theory, since all the indexes of aging (LE, old age index) were not found correlated.

Death is always related to aging, and figures reported by Health Authorities [17], in relation to deaths supposedly due to Cov19, do not compare the data with those of the normal population in the same age range. In relation to the gender, it is known that in general females deaths between 50 and 80 years is lower than in male (respectively about 21 % and 38 %) [12]. In the case of Cov19 this difference is more consistent (respectively 30 % and 58 %) and apparently females seem to be less affected by the Cov19.

Recently, the problem of deaths in nursing homes was emerging as a disaster. In Italy, nursing homes should be considered as a "separate Region", accounting for about 40 % of the total death (approximately like Lombardia) characterized by a very common variables, the abandonment of affection even much worse than for orphaned children, living in the most aggregated environment. This is a totally different drama, more acute because it has been

shown that aging is not a correlated variable for Cov19 death. In other terms, one may not give the responsibility of all these deaths to the virus only.

Based upon these data, there are Governments suggesting to continue the lockdown for people > 65 years old. The current results showed that there are no basis at all for this senseless initiative. The people have to stay home only in case they are positive to swabs, all the other imaginative or compulsory rules are severely violating the freedom.

Chronic therapy, diseases, and smoking

It was evident that Cov19 causes a severe pneumonia, and the need of ventilation in emergency rooms was the neck of the bottle [1], aggravated by the lack of any specific treatment. The official data [17] were reporting that subjects suffering from chronic diseases are supposed to be more fragile and easily aggressed by Cov19, in particular those affected by CVDs (hypertension, ischemic heart disease) and diabetes. This aspects need a larger number of cases to be properly defined.

Using the official data retrieved for the present analysis [2], there was no correlation between Cov19 diabetes, CVDs and smoking. At the opposite, since negative correlations were found it seems that the trends of these diseases were toward a protection instead of a damage. However, one explanation could be that following diabetes and CVDs the life style of the patients is in some way more controlled. In the end, it seems that Cov19 is more likely behaving as an independent disease.

Social variables

Significantly positive correlation were shown with cars, and internet connections. These variable are typical of the well being status, which is mirrored by the GDP that was found to be positively correlated with Cov19 [1], and consistent with more frequent interrelations among people.

No correlation was found with cell phones, since their use is extremely common, such as every person has a cell phone (and even more than one).

Buses

The number of buses was shown to be negatively correlated with Cov19, indicating that the more buses available the less virus spreads.

Rivers and water

What has been found in terms of positive correlation needs some more details.

Most of the rivers were considered (75 rivers), in terms of Km of routes in the territory, unfortunately without considering their water flow. Since the minor rivers (> 200) are generated by the main rivers, the figures can be taken as a reliable picture of the total rivers that spray the regional territories. Furthermore, lakes were not considered, and they are much more represented in North of Italy.

Despite most of them are generated by rivers, some lakes are not (e.g. Orte in Piemonte, Trasimeno in Umbria, Varano in Puglia). However, it was difficult to transform the lakes area into linear Km, and adding further Km did not change the correlation (on the contrary it was increased). Because of this, the positive relation with Cov19 should be taken as reliable. It has to be considered also that this correlation is parallel to the flat land, which was been found also positively correlated.

Unfortunately, the rivers water is most of the time a vehicle of garbage, which is generated mainly (but not only) by small and large factories. During the lockdown (that stared at March 8th), the reduction of their activity allowed, the water to become clean and clear, meaning that most of the pollution was not domestic but mainly industrial.

In other terms, rivers may be an epiphenomenon of the flat land, and for these reasons the water should be addressed as a possible important virus spreader. The issue of the strong correlation with domestic water consumption (the highest in this study) has to be taken with care also. Can the virus diffuse trough the water? The temperature generated by the water can influence the viral growth?

We mentioned already that the high temperature may reduce the viral contamination, which is not the case of water contained in rivers and lakes or for domestic water, since during spring and winter their temperature is never exceeding 25-26 ^{o}C.

One possible explanation can be drawn from the viral structure. The Cov19 structure consists of 4 main sets of proteins: S (spyke), N (nucleocapsid), M (membrane, and E (envelop). The S mediates the viral cell-cell fusion with adjacent non infected cell, forming giant syncitia which allow the viral spreading. The E protein, despite being the smallest of the group, is important for viral spreading, because its loss determine the reduction of the viral titres [18].

The E protein is hydrophobic, and can protect the virus from the water. A consistent increase of temperature can modify this protein making it less effective, but this not the case of the water at the common temperature, no matter if domestic or pertaining to rivers/lakes. The dimension of Cov19 is between 100-150 nm, and masks with a filter of 30 nm are efficient to stop the viral air contamination. The filtering devices, used sometimes for domestic water, can stop particles up to 20,000 nm and the in case of Cov19 are totally useless.

An efficient water purification system usually eliminate the viral charge either for filtration and by physico/chemical treatment (e.g UV, chloride, NaClO). However, contamination can take place once the water gets into the pipelines of the territories and houses. The domestic water consumption can be also an epiphemenon of the well being status, such that higher quantity can be used for the life style habit, and does not mean that is used for drinking. However, more water means also more evaporation and spreading contaminants within the evaporating particles. Because of this, one

may not rule out a direct/indirect effect of water, and this aspect needs appropriate studies and controls.

The future with Cov19

This aspect is matter of debate among experts and was not the aim of this study.

However, in terms of trends, the curves of the viral positivity and relative deaths showed the pick around the 3rd or 4th week of March (more or less within 3 to 4 weeks from the starting of the first symptomatic cases). This can be easily determined considering those five Regions where no cases were present at March 1st (Friuli, Trentino Alto Adige, Basilicata, Umbria Val d'Aosta). After the pick values, the curves of positive case and deaths are decreasing with an asymptotic shape, and projections up to the value zero cannot be determined properly; one may hope they reach a stable minimum just above zero, but for the moment is not possible to give a proper figure.

However, the violence of the virus together with the high number of asymptomatic subject indicate that Cov19 is most probably part of the human meta-organism already, and one may expect that will be very hard to get a rid of it. As it was for AIDS and some hepatitis virus, humans have to cohabit with the virus, and it is necessary to undertake similar procedures to protect the patients both in terms of prevention and therapy. This is not like to say one may expect another "wave" around September or October. Probably every year will be the same, with the difference that we will be more skilled to face the disease.

Conclusion

Despite some bias, we think that the data of the present report may give some insights regarding the Cov19 spreading through Italy, particularly in the most productive and prosperous Regions where it is a real dramatic concern.

However, some statements like aging and concomitant diseases (and smoke) seem to be not well documented, and may generate unnecessary problems. The lockdown and use of masks for sure has limited the viral spreading; and the population density together with the interpersonal physical contacts (e.g. busses or trains, planes) should be limited as much as possible. This does not mean that elderly people are obliged to live segregated, and workers cannot do their job in security. The problem of water pollution has to be faced carefully because it may represent an hidden spreader.

The economical and political issues to support the economy should take into account that only a part of Italy was seriously affected, and these Regions need more support than others were the problem of Cov19 was not so devastating.

It has to be mentioned that in Lombardia the Cov19 deaths in relation to the population are 5 times higher than those recorded in USA, and at least twice those recorded in all the other European countries (John Hopkins records on coronavirus May 2020).

However, the Regions of Southern Italy and Islands, usually more frequented by tourists, were relatively spared.

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UC conceived the trial; UC, GB, MRC, RC were collecting the data; MR was in charge to make the statistical evaluation, UC wrote the text.

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