COVID-19 AND MULTIDIMENSIONAL WELL-BEING: THE CASE OF THE ELDERLY IN ITALY

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1. Introduction

Older adults among vulnerable groups have been disproportionately affected by COVID-19 (Mueller et al., 2020).

The COVID-19 pandemic is much more than a health crisis, as it has a fundamental impact on the societies and economies. In fact, its impact is multiple, and the analysis requires information covering different angles of individuals' life and appropriate empirical research spanning from economics to statistics, demography and computer science.

Sen (1980) has been the first treating well-being as a multidimensional concept, which depends on monetary and non-monetary variables.

In fact, initially income was suggested to properly reflect society and individual's quality of life, yet this statement has been strongly reconsidered. Most of the existing studies have shown that the concepts of quality of life and well-being cannot be exclusively defined in terms of material deprivation and must also consider subjective and objective aspects depending on non-monetary variables.

Therefore, the main goal of the paper is to understand and analyze the consequences of the COVID-19 outbreak on elderly Italian individuals by estimating the multidimensional effects of the current health emergency related to the COVID-19 pandemic on different domains of well-being. This goal is particularly relevant since the actual scientific debate is mainly focused on the macroeconomic effects of the pandemic and only some research concerning the effects of pandemic on well-being has been published (see for example Grané et al., 2021 and Atzendorf and Gruber, 2021).

Shocks that individuals experienced in the first and the following waves of the COVID-19 pandemic can be analyzed through composite indicators aimed at measuring changes in well-being before (pre-COVID period[1]) and after COVID-19 (March 2020).

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[1] In the rest of the paper the author refers to pre-COVID period as regular period.

The choice of studying COVID-19 effects on well-being, and not only on the economy, is motivated by fact that many studies in this field have explored purely economic aspect, which consider only material living standards, exploiting the concept of multidimensionality (Ivaldi et al., 2016; Bleys, 2012; Gigliarano and Mosler, 2009).

European Commission's "Going beyond GDP" initiative and Stiglitz (2009) have pointed out that income alone does not reflect the multi-faceted nature of the well-being suggesting that other indicators monitoring economic and social progress should be developed to complement it.

Several initiatives have taken place proposing multidimensional well-being indicators. For instance, Human Development Index (HDI) proposed by the United Nations Development Program which offers countries' mean (or geometric mean) achievement in income, education and health dimensions (Malik, 2013), and Better Life Index (BLI) established by the Organization for Economic Cooperation and Development which aggregates achievements in 11 domains (Durand, 2015).

Following this stream of literature, an individual well-being change index has been constructed and applied to the Survey of Health, Ageing and Retirement in Europe and Israel (SHARE) data set looking at the direction (downward, upward and net overall deprivation) of well-being changes before and after COVID-19 of Italian elderly population.

Since the pandemic has a varying impact on different population groups -related to age, gender, economic and work status- analysis is carried out by subgroups.

Findings suggest that employed and richer individuals suffer greater well-being losses, while results on gender is not statistically significant. Moreover, second year of the pandemic highlights the key role of the self-perceived health on well-being leading to greater contributions of health dimension to upward and downward changes.

Following Ciommi et al. (2014), dominance criteria are introduced to compare Italian situation during the first and second year of the pandemic.

In the following sections, we describe the well-being change index, and we conclude with some results.

2. Data and methods

We consider Italian data provided by the Survey of Health, Ageing and Retirement in Europe and Israel (SHARE). This database gathers microlevel information on health, well-being, and socioeconomic characteristics for the population aged 50 or older. We focus on the longitudinal individuals of the waves

8 and 9 responding to three different surveys: wave 8 regular survey (regular), wave 8 SHARE Corona Survey (1st SCS) and wave 9 SHARE Corona Survey (2nd SCS)[2].

Health, employment, equivalent income, the ability to make ends meet and social connections are used to construct the well-being change indices as described in Table 1[3].

Table 1 – *Survey variables of the first and second SHARE Corona Survey used to construct the multidimensional well-being indicator.*

Well-being domain	Variables
Health	Self-perceived health change since the outbreak
Social connections	Volunteered since outbreak
Financial distress	Household's total monthly income able to make ends meet
Income	Income quantile change before and after outbreak
Work	Unemployed, laid off or business closed due to COVID-19

We compute three different measures to catch downward, upward and net overall changes in the individual multidimensional well-being for the two different time periods: regular-1st SCS and regular-2nd SCS.

Consider a population of individuals $i = 1, \dots, n$ over periods of time t and $t - 1$, and denote with x_t^{ik} and x_{t-1}^{ik} the value of the k-th well-being indicator at time t and $t - 1$ respectively, with $k = 1, \dots, K$. The individual downward well-being change index is defined as:

$$d_i = \frac{\sum_{k=1}^{K} 1(x_t^{ik} < x_{t-1}^{ik}) v_k}{\sum_{k=1}^{K} v_k}, \tag{1}$$

where v_k is the weight of each well-being indicator such that $\sum_{k=1}^{K} v_k = K$. In what follows, we assume equal weight of the well-being indicators such that $v_k = 1/K$, for $k = 1, \dots, K$. The downward index measures the incidence of downward changes in the individual well-being dimensions over time: moving from $t - 1$ to t.

Similarly, the individual upward index u_i counting the incidence of positive well-being changes is given by:

$$u_i = \frac{\sum_{k=1}^{K} 1(x_t^{ik} > x_{t-1}^{ik}) v_k}{\sum_{k=1}^{K} v_k}. \tag{2}$$

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[2] Data refer to October 2019-March 2020, June-August 2020 and June-August 2021, respectively.

[3] For the complete list of variables used in the analysis we refer to Polinesi et. al, 2022. The choice of the domains is based on the work of Grané et al. (2021).

From d_i and u_i the individual overall deprivation change index, considering the compensatory effect between downward and upward changes, can be defined as:

$$o_i = \max\{0, d_i - u_i\}, \tag{3}$$

when individuals experience more improvement of the well-being dimensions with respect to worsening o_i is equal to 0.

The aggregate well-being change index M, aimed to assess the intensity of the COVID-19 effects in each subgroup or country, can be defined as the weighted mean of individual changes:

$$M = \frac{\sum_{i=1}^{n} m_i^{\alpha} w_i}{\sum_{i=1}^{n} w_i}, \tag{4}$$

where the generic m_i represents the individual well-being change index defined in Eq. (1)-(3), w_i is the individual sample weight such that $\sum_{i=1}^{n} w_i = 1$ and the parameter $\alpha \geq 0$ indicates the sensitivity to changes[4]. In this paper we set $\alpha = 0,1$ representing the headcount ratio and the gap: the proportion and the average proportion of the population experienced a worsening/improvement or deprivation in at least one well-being dimension. All the indices considered range between 0 and 1.

3. Results

In this section, we present results of well-being change and overall deprivation indices defined in Eq. (3) separately for the two time periods. We consider total and subgroup indices across elderly Italian individuals (Fig. 1), then investigate differences between social groups (Table 2[5]).

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[4] Properties of the well-being changes index are listed in Polinesi et al., 2022.
[5] Results do not change with α=0.

Figure 1 – *Headcount (α=0) and gap (α=1) of well-being changes and deprivation in Italy: first SCS and second SCS.*
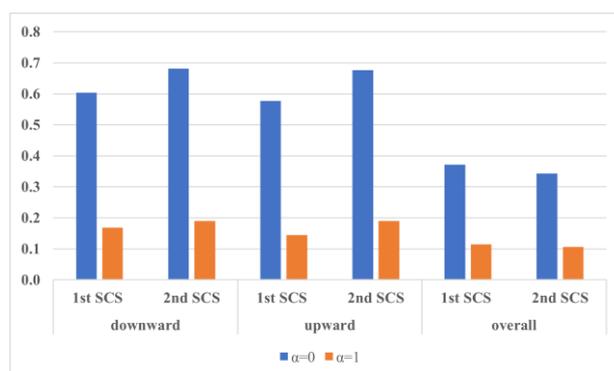
Table 2 - *Well-being change and overall deprivation indices (α=1), total and by subgroups (index and 95 % bootstrap confidence interval). 1ˢᵗ SCS (a) and 2ⁿᵈ SCS (b).*

(a)

	Downward			Upward			Overall		
	Index	95% CI		Index	95% CI		Index	95% CI	
Total	0.169	0.160	0.178	0.144	0.137	0.152	0.115	0.105	0.125
Gender									
Male	0.158	0.152	0.162	0.144	0.139	0.149	0.108	0.103	0.113
Female	0.163	0.158	0.167	0.146	0.143	0.149	0.111	0.107	0.115
Education									
≤ lower secondary	0.156	0.145	0.165	0.155	0.147	0.164	0.104	0.094	0.114
Upper secondary	0.205	0.185	0.226	0.125	0.109	0.143	0.146	0.120	0.170
Tertiary	0.152	0.123	0.177	0.128	0.101	0.160	0.094	0.070	0.117
Work status									
Retired	0.138	0.131	0.147	0.160	0.152	0.168	0.092	0.085	0.101
Employed	0.228	0.211	0.250	0.116	0.101	0.132	0.162	0.140	0.189
Other	0.134	0.116	0.152	0.158	0.144	0.172	0.084	0.066	0.102
Income quantile									
First	0.097	0.076	0.118	0.195	0.174	0.216	0.051	0.030	0.072
Second	0.100	0.087	0.114	0.228	0.213	0.242	0.053	0.042	0.065
Third	0.155	0.138	0.172	0.151	0.133	0.170	0.101	0.084	0.118
Fourth	0.201	0.185	0.218	0.133	0.117	0.146	0.130	0.109	0.155
Fifth	0.242	0.225	0.260	0.063	0.050	0.076	0.192	0.169	0.217

(b)

	Downward			Upward			Overall		
	Index	95% CI		Index	95% CI		Index	95% CI	
Total	0.190	0.181	0.199	0.190	0.182	0.200	0.106	0.096	0.116
Gender									
Male	0.180	0.174	0.185	0.185	0.180	0.190	0.109	0.103	0.114
Female	0.182	0.178	0.187	0.184	0.180	0.187	0.110	0.106	0.114
Education									
≤ lower secondary	0.181	0.168	0.194	0.199	0.188	0.209	0.100	0.087	0.115
Upper secondary	0.219	0.202	0.241	0.174	0.158	0.190	0.127	0.105	0.153
Tertiary	0.175	0.142	0.211	0.175	0.143	0.203	0.090	0.062	0.122
Work status									
Retired	0.171	0.164	0.178	0.207	0.199	0.217	0.092	0.084	0.100
Employed	0.249	0.223	0.274	0.153	0.133	0.170	0.159	0.130	0.189
Other	0.154	0.140	0.169	0.206	0.193	0.221	0.068	0.056	0.081
Income quantile									
First	0.122	0.106	0.140	0.257	0.237	0.275	0.032	0.023	0.041
Second	0.135	0.122	0.148	0.271	0.256	0.285	0.051	0.040	0.061
Thirth	0.207	0.168	0.238	0.183	0.165	0.203	0.138	0.099	0.169
Fourth	0.213	0.200	0.227	0.175	0.157	0.192	0.108	0.092	0.127
Fifth	0.256	0.238	0.275	0.090	0.079	0.104	0.187	0.166	0.207

Table 1 highlights a recovery effect in terms of multidimensional well-being during the second period of the analysis. In fact, moving from first year of the pandemic to the second one, downward and upward well-being changes increase differently from the overall deprivation index which decrease.

Splitting the analysis by subgroups according to the gender, one may note that the difference between males and females is not statistically significant, while education, work status and income class have a significant effect. Upper secondary education implies significantly more downward changes with respect to primary and tertiary education. Employed and self-employed workers are significantly more deprived than retired (0.228 vs 0.138 and 0.249 vs 0.171, first and second SCS respectively). Moreover, poorest and middle classes (first-third income quantiles) are less affected by downward changes than individual belonging to higher income classes (fourth and fifth quantiles).

Figure 2 looks at the frequency of elderly individuals changing in the well-being dimensions (k).

Figure 2 – *Frequency of individuals deteriorating/improving and changing according to different well-being cut-off (k). k=0 indicates individuals associated with no change, on the contrary, k=1 indicates individuals who change in all dimensions considered.*
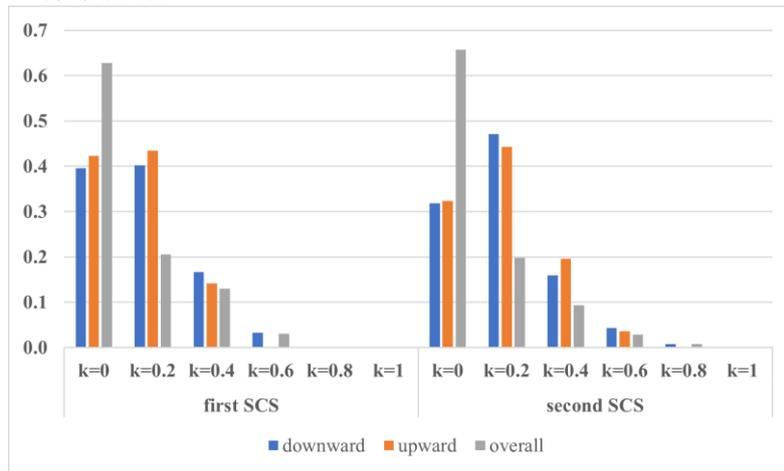
Moving to the second year of the pandemic frequencies of upward changes associated with 1 (k=0.2), 2 (k=0.4) and 3 (k=0.6) dimensions strongly increase highlighting the recovery phase of the epidemic crisis.

Figure 3 shows the contribution of each dimension to the construction of the well-being change indices. Note that, second year of the pandemic highlights the key role of the self-perceived health on well-being leading to greater contributions of health dimension (pink bar) to downward, upward and overall changes.

Figure 3 – *Frequency of individuals deteriorating/improving and changing by well-being dimensions (k) for the 1st SCS and 2nd SCS. Health dimension (pink), social dimension (blue), work dimension (green), ability to make ends meet (yellow), income dimension (orange).*
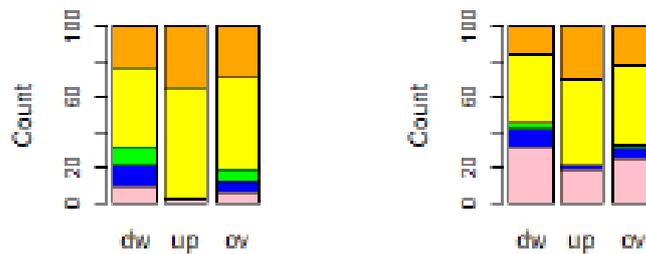
Greater contribution of the health dimension on downward and upward changes during the second period analyzed can be explained by the fact that no changes with respect to the regular period in the health dimension sensitively decrease while worsening and improvement increase (Table 3).

Table 3 – *Frequency of individuals worsening (-1), improving (1) and not changing (0) according to each well-being dimensions: 1ˢᵗ SCS (a) and 2ⁿᵈ SCS (b). Work dimension excludes upward change by construction.*

(a)			
	-1	0	1
income quantile	0.369	0.173	0.458
financial distress	0.201	0.554	0.244
health	0.080	0.907	0.012
social	0.100	0.893	0.007
work	0.094	0.906	NC
(b)			
	-1	0	1
income quantile	0.376	0.157	0.468
financial distress	0.148	0.566	0.286
health	0.310	0.507	0.183
social	0.090	0.896	0.015
work	0.029	0.971	NC

The dominance criteria introduced by Lasso de la Vega (2010) guarantee reaching robust conclusions when we compare overall well-being change indices in the first and second year of the pandemic[6]. With this aim, Deprivation Curves in Figure 4 are obtained by plotting, the identification cut-off (k) against the multidimensional headcount ratio, i.e., the percentage of individuals deprived in at least k dimensions. The obtained curve shown in Figure 4 is the so-called First dimension deprivation curve (henceforth FD).

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[6] Dominance conditions are based on simple graphical devices that provide a tool for checking the robustness of well-being to changes in the identification cut-off.

Figure 4 – *FD curves for the 1st SCS and 2nd SCS.*
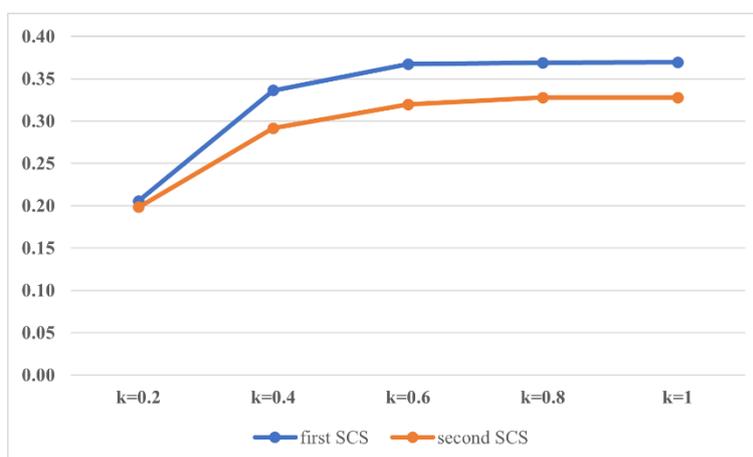
Lasso de la Vega (2010) proves that if the FD curve associated to a country is everywhere to the left and above another FD curve associated to another country or when the curves are associated with the same country but in a different period, then the second one has lower deprivation than the first one for any multidimensional deprivation measure satisfying Focus, Monotonicity, Symmetry and Replication invariance and for any identification cut-off. Therefore, Figure 4 indicates an improvement in multidimensional well-being associated with the second year of the pandemic.

4. Conclusion

The paper contributes to the analysis of variation of well-being relatively to the elderly Italians. Specifically, we compute a multidimensional index that captures changes in the level of individual well-being during first and second year of COVID-19 pandemic.

Findings suggest that employed and richer individuals suffer greater well-being losses with higher downward changes than upward ones, while gender is not significant in discriminating against changes in individual well-being.

First dimension curve indicates an improvement in multidimensional well-being associated with the second year of the pandemic.

Further research will be aimed to include regional dimension in the study of Italy.

Acknowledgments

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SUMMARY

The aim of the study is to analyze multidimensional well-being changes in Italy at individual level between regular period end COVID-19 period using SHARE data. To this aim, we propose a well-being change index measuring negative, positive and non-directional changes. Analysis by subgroup is introduced to investigate more vulnerable groups to COVID-19 among elderly Italian population.

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