

Working paper

The Impact of COVID-19 on Well-Being: A Systems Approach

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Abstract

In addition to its health and economic implications, COVID-19 has a widespread effect on social relations, stress, livelihood, and on the environment. However, analyses of the effects of COVID-19 tend to focus on the health and economic implications of the pandemic. In recent years well-being is increasingly promoted as a measure to assess the state of countries and citizens, taking into account a broad set of factors such as social relations, the environment, health, and livelihood. Previous work at IIASA has produced a national well-being map, in which the variables that affect both current and future well-being were spelled out, as well as the relations between them. In the current study, we utilize the IIASA national well-being map as a basis for analyzing the effects of COVID-19 on social well-being, focusing on Israel as a case study. Thus, while the indicators used are based on the OECD well-being indicators, they are contextualized to account for both the setting and for the focus on social well-being of current generations (those that are most likely to be affected by COVID-19). However, the approach we suggest can be useful for other cases, and the results may shed light on the COVID-19 effects elsewhere.

To this end, we first identify the direct effects of COVID-19 and the measures undertaken to mitigate the immediate health effects on the variables included in the social well-being map, a modified version of the original national well-being map. These served to identify both the primary and secondary effects of COVID-19. By relating these primary and secondary effects on the variables that affect social well-being, we can identify how COVID-19 affects current social well-being, differentiating these effects by timing. Then we show that there are synergic effects that will lead to long-term implications, also after the pandemic is brought under control.

COVID-19 does not affect all population groups equally. We find that the effects of COVID-19 on employment serve as the stratifying variable that differentiates the effects. Hence, we analyzed the well-being effects of COVID-19 on different groups based on the effects the pandemic has had on employment. This analysis shows that while the well-being of all groups is affected, they are particularly wide and strenuous for those who lose their jobs or businesses. Therefore, job retention and mitigation of the job insecurity effects of COVID-19 are found to be of critical importance, more than income maintenance. These variables are also essential for the maintenance of trust in government, as such trust is crucial when the next wave of the pandemic erupts. However, additional measures that may mitigate the effects on other well-being indicators are also called for. Thus, it is advisable to formulate policy packages that will address the multi-dimensional effects on well-being.

Acknowledgments

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The Impact of COVID-19 on Well-Being: A Systems Approach

1. Background and Purpose of the Study

COVID-19 has widespread effects. Yet, they differ in their extent and severity between countries and within them.

Analyses of the effects of COVID-19 tend to focus on the health and economic implications of the pandemic. That is the number of people affected, the number hospitalized or died, and the impacts on GDP and employment. However, it is clear that there are broader effects, such as the effects on social relations, stress, livelihood, and on the environment.

As is increasingly recognized, the GDP per capita is an insufficient measure to assess the state of countries and citizens within them (Stiglitz et al., 2009). Hence well-being is increasingly promoted as a measure to assess the state of countries and citizens. In particular, the (OECD, 2017) advanced a set of 39 indicators for well-being. These are comprised of indicators of the current well-being (25 indicators) and future well-being and resources (14 indicators). As the COVID-19 effects are immediate and will be felt predominantly in the upcoming few years, we focus only on the effects it has on current well-being.

Previous work at IIASA has produced a national well-being map, in which the variables that affect both current and future well-being were spelled out, as well as the relations between them via additional essential variables (Ilmola-Sheppard et al., 2020). In this map, some of the OECD indicators were slightly modified. In the current study, we utilize the IIASA national well-being map as a basis for analyzing the effects of COVID-19 on social well-being, focusing on Israel as a case study. However, the approach we take can be useful for other cases, and the results may shed light on the COVID-19 effects also elsewhere. **Social well-being** is the subjective well-being of individuals, expressed in terms such as life satisfaction, within a societal context. Thus, social well-being combines material components with personal components and components of social capital (Hellewell & Putnam, 2004).

The effects of COVID-19 are felt today by the current generations. Hence, we focus exclusively on the effects of COVID-19 on current well-being. As the previous works concentrated on national well-being while focusing on social well-being, we further modified both the OECD indicators (OECD, 2017) and the IIASA version (Ilmola-Sheppard et al., 2020). In particular, we added (outdoor) *recreation opportunities* as a well-being indicator and added or adjusted some relevant variables to the COVID-19 case, particularly *public transport* (which was affected by the response to COVID-19), as well as some environmental variables. These are detailed below. Concurrently, we took out some of the variables that were included in the national well-being map as they proved to be irrelevant for the current social well-being effects of COVID-19. The new map, including the added variables and without the variables deemed less relevant for assessing current social well-being, is termed the **social well-being map** and serves to assess the effects of COVID-19 on current well-being.

The first step in this project was to identify the direct effects of COVID-19 and the measures undertaken to mitigate the immediate health effects on the variables included in the social well-being map. To this end, we first mapped the implications of COVID-19 and the immediate measures implemented to mitigate its health effects for components included in the well-being map. The components thus identified were marked in the

social well-being map as those affected directly by COVID-19. Then, the effects of the implications the effects of COVID-19 has for these components were traced out in the social well-being map. To identify the implications of the effects thus traced for well-being, we first marked the current social well-being indicators on the map. Using the backward mapping feature of the Vensim software, we identified the variables that affect the current social well-being. By relating the primary and secondary effects of COVID-19 to the variables that affect social well-being, we were able to identify how COVID-19 affects current social well-being.

COVID-19 does not affect all population groups equally. In fact, there is increasing evidence indicating that COVID-19 increases inequities (Economist, 2020). The equity impacts do not conform strictly to existing stratifying criteria (such as socio-economic, demographic, ethnic, or residential location). Based on the analysis of the maps, we identify the effects of **employment as the stratifying variable**. Therefore, we also analyze the equity facets of the well-being implications of COVID-19, according to impacts on employment of the household.

In the next section, we describe the connections we made between COVID-19 and the social well-being map and the adjustments we made to the national well-being map to record the components and connections relevant for the social well-being map. In this section, we also describe the evolution of COVID-19 in the Israeli case, thereby grounding the more general systems discussion. We use this grounded description to map out the immediate effects of COVID-19 and the government's reaction to the outbreak of the pandemic. Then, in section 3, we describe the direct and indirect effects of COVID-19 on current well-being as we defined it, differentiating the effects by time – whether they materialized in the first wave of the pandemic or later. As there are synergic effects, we outline several loops whereby the effects are amplified. However, as there are innumerable possible loops, we only outline several poignant ones arguing that such amplifications are likely. In the subsequent section, we identify in detail the equity implications. Finally, we identify some implications of this work for policy, which will be the focus of the next stage of the study.

2. The Direct Effects of COVID-19

2.1. The COVID-19 Outbreak¹

The first cases of COVID-19 were reported in Wuhan, China, in December 2019. On January 5, 2020, the WHO published the first news of an outbreak of unknown cause. The organization declared COVID-19 to be a public health emergency of international concern by the end of January, and on March 11 declared it a pandemic.

Coronaviruses are a large family of viruses which mostly infect birds and mammals. However, having crossed the species barrier to infect humans, they cause respiratory disease outbreaks and become lethal. COVID-19 is the third pandemic caused by coronaviruses in the 21st Century, having been preceded by the SARS and MERS pandemics. However, while SARS and MERS had significantly higher case fatality rates than COVID-19 (Petrosillo et al., 2020), COVID-19 is more infectious, leading to much greater case numbers. Overall deaths attributed to COVID-19 far outweigh those from SARS and MERS - more than 1,250,000 as of November 10,

¹ The first two sub-sections, the general and Israeli background are largely based on Feitelson et al. (2020).

2020². The scale and intensity of the damage experienced globally from COVID-19 thus far exceed those of the previous pandemics, which were limited to a small number of countries.

Measures have been undertaken by most governments worldwide to address COVID-19, and particularly travel restrictions and business interruptions, have led to a global recession. The COVID-19 pandemic is expected by the World Bank, to lead to a fall of more than 5% in GDP globally, the deepest recession in eight decades (World Bank, 2020). The question remains to what extent does this expected recession affect personal well-being.

2.2. The COVID-19 Outbreak in Israel and the Government's Response³

Israel was fast to react to the WHO declaration initially. On January 27, the Director-General of the Health Ministry signed a decree under the Public Health Ordinance, adding COVID-19 to the list of infectious diseases. It was followed on February 2 by a decree ordering all entrants from China to remain in home isolation for 14 days.⁴ The order was subsequently extended to other Far East Asian countries, some European countries, and finally to all entering Israel (March 8, 2020). The first infected persons were identified in late February, just before a general election (held on March 1, the third within a year).

On March 5, the decree of the General Director of the Health Ministry was extended to prohibit large gatherings and international conferences. On March 15, it was significantly extended, prohibiting gatherings of more than ten people, closing schools, university campuses, gyms, etc. Since March 15, the government has begun to enact emergency regulations in accordance with section 39 of Basic Law, which empowers the government to pass emergency regulations that may alter any law or temporarily suspend its effect.⁵

Using these emergency powers, during a political crisis, the government issued dozens of emergency regulations aimed at preventing the spread of the epidemic,⁶ including closing borders, imposing lockdowns, isolating infected people, limiting public transportation, and authorizing the General Secret Service (GSS) to employ its technological capacities in locating points of contact of infected people. Following the regulations issued by the government restricting workplaces to maintain only 30% and subsequently 15% of their workers at a time,⁷ many workplaces were forced to fire employees or put them on unpaid leave. As of May 2020, more than a million workers had registered since the onset of the virus with the Employment and Social Security Service; most (88%) being forced to take unpaid leave.⁸

² <https://www.worldometers.info/coronavirus/>

³ This section describes the situation as of September 2020

⁴ Section 20 of the Public Health Ordinance, 1940 states that once the Director General of the Health Minister declares that the health of the public is seriously threatened by the existence or a threat of an infectious disease, the Director of Health Services is authorized to issue orders or decrees implementing a long list of measures, including removing, isolating, arresting, supervising and treating infected people and people that are in contact with them, and also people who are suspected of being recently liable to being infected. These are draconian powers that have never been exercised and thus did not prompt judicial oversight.

⁵ Section 39 empowers the Knesset (Israeli legislature) to declare a state of emergency for one year upon ascertaining that the State is in a state of emergency. As long as such declaration is in force, the government is authorized to issue emergency regulations that may alter any law, or temporarily suspend its effect. Such regulations cannot violate human dignity and are subject to judicial review. In fact, since the declaration of independence in 1948, Israel has been under the declaration of a state of emergency, which is renewed by the Knesset every year.

⁶ https://www.nevo.co.il/general/CoronaUpdates.aspx?utm_source=activetrailand&utm_medium=emailandutm_campaign=%d7%9c%d7%a7%d7%98%20%d7%99%d7%93%d7%99%d7%a2%d7%95%d7%aa%20-%20%d7%9e%d7%a8%d7%a5%202020

⁷ Emergency regulations (limiting the number of workers in the workplace to reduce the spread of the new corona virus, year 5765), 2020

⁸ Chief Economist of the Ministry of Finance,

https://www.gov.il/BlobFolder/dynamiccollectorresultitem/periodic-review-07072020/he/weekly_economic_review_periodic-review-07072020.pdf

Israel was under an almost general lockdown for one month (19 March-19 April). By May 4, the number of new infection cases per day fell to only a few dozen per day. Since April 24, the Israeli economy has re-opened⁹ (too fast according to many critics), with no clear strategy and amidst major disagreements among government offices and confusing public guidelines. Gyms, malls, markets, and schools returned to almost normal activities under mild restrictions regarding masks and social distancing (Ashkenazi 2020).

By the second half of June, the number of daily infected people increased significantly (Efrati & Huri 2020). From less than 20 new cases per day between May 10 and May 25, the numbers climbed to over 1000 on July 4 and over 2000 by early September, leading to some restrictions being re-imposed, particularly regarding gatherings. The numbers of daily new cases and deaths are presented in Figure 1.

The second wave of the virus has been accompanied by a second wave of unemployment (Klingbell & Degani 2020), along with a sharp rise in the number of people applying for food aid and social services (Ilan 2020). The rise in unemployment has brought strong criticism of the government's handling of the crisis, both the economic impacts and the lockdown exit process.

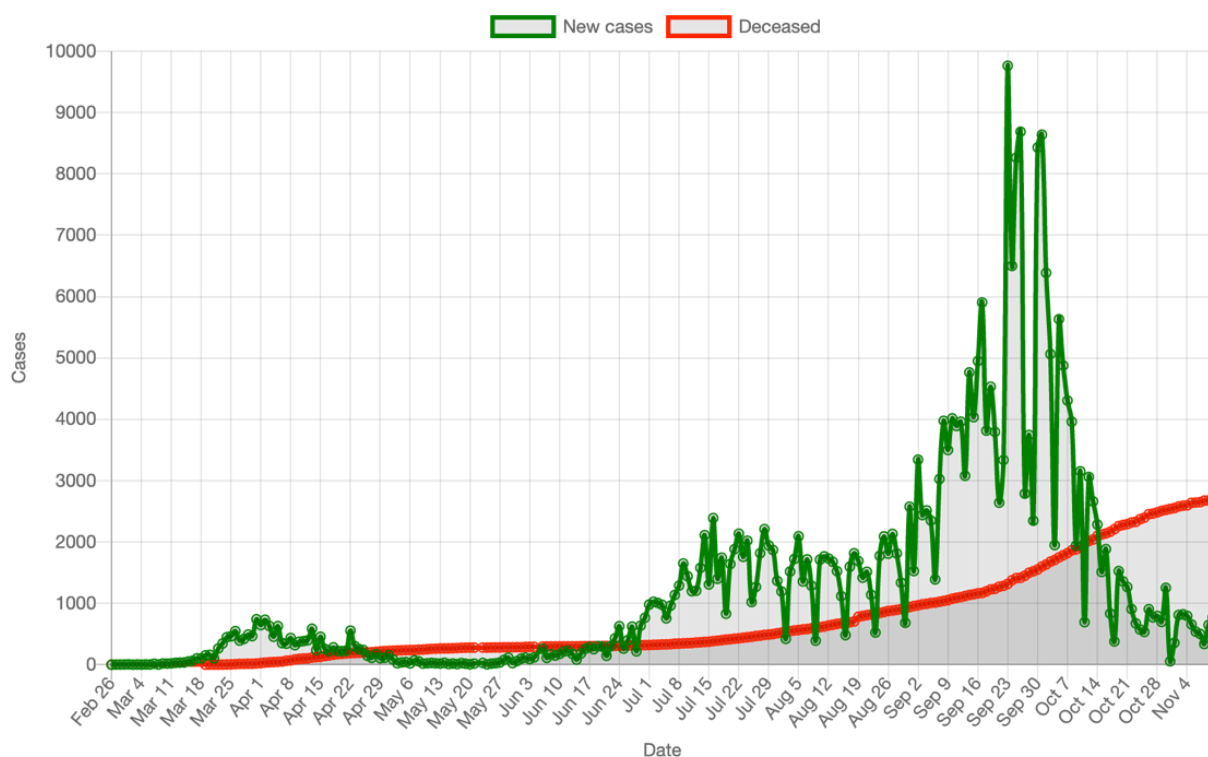


Figure 1. Daily new COVID-19 cases in Israel (Hanukoglu, 2020).

While the government did allocate significant funds, they were not distributed effectively. Moreover, the programs the government proposes to ameliorate the economic effects were largely reimbursement for loss of business and some compensation to the unemployed, with only limited attention given to the rejuvenation of the economy.

⁹ April 24 - https://www.gov.il/he/departments/news/24042020_01 food hairdressers and street shops; May 4 - https://www.gov.il/he/departments/news/04052020_02 hotels, malls, markets, May 19 - https://www.gov.il/he/departments/news/19052020_04 restaurants, clubs and pubs, swimming pools, June 14 - https://www.gov.il/he/departments/news/19052020_03 banquet halls

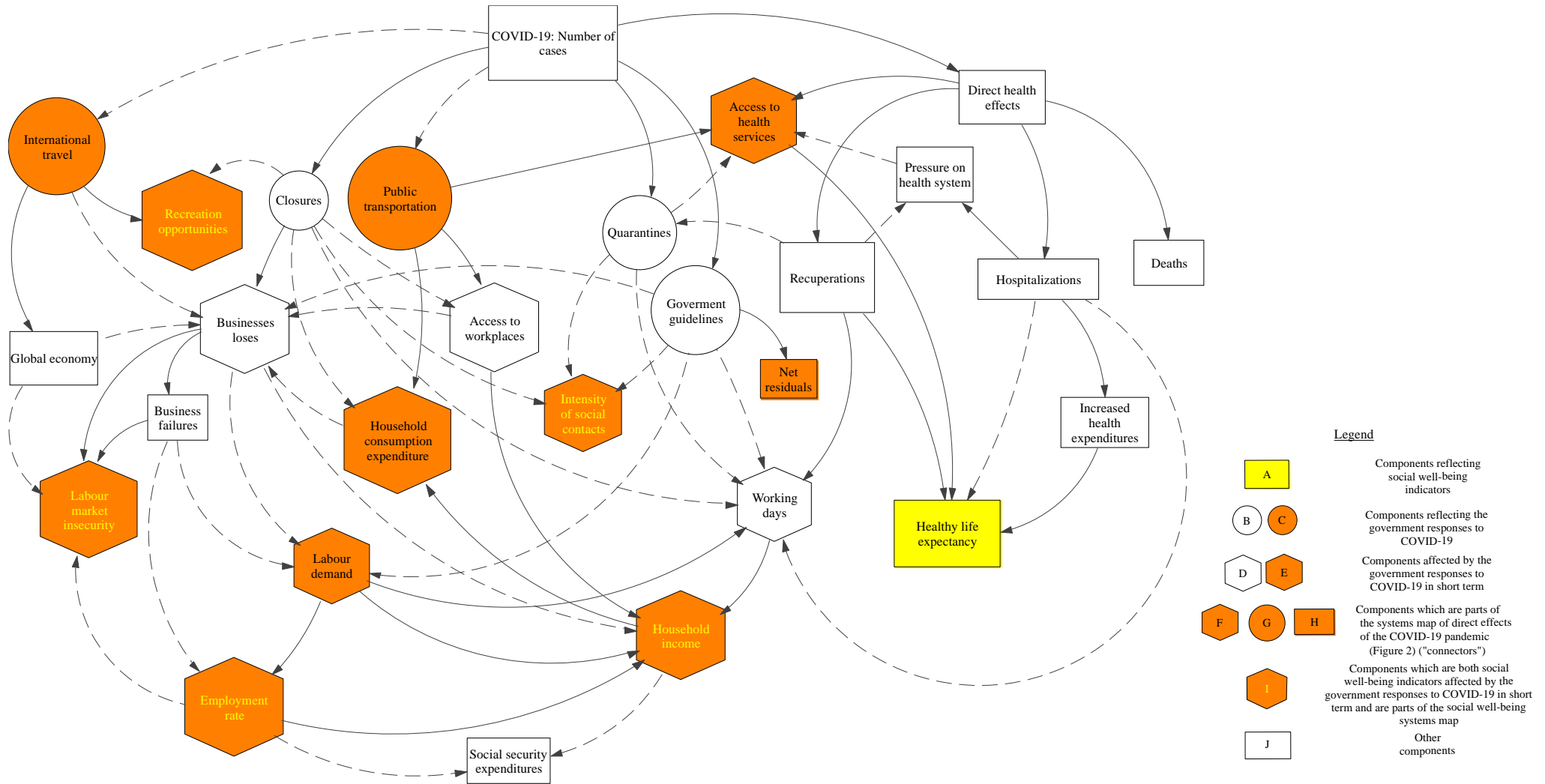


Figure 2. Systems map of direct effects of the COVID-19 pandemic.

2.3. The Direct Effects of COVID-19

The immediate health effects pertain to those infected. They can be divided into those who passed away, those who were hospitalized, and those who recuperated without hospitalization. These latter two groups lost working days, and this may affect their expectations for a future healthy life as the long-term effects of COVID-19 infections are still unclear.

Figure 2 displays the immediate health effects of COVID-19 and government mitigation measures. The government's reactions (presented in circles) can be divided into bans on international travel, lockdowns or partial closures, restrictions on public transport use, the quarantine of people who were thought to have been in proximity to people who were identified as infected, and various guidelines. These government guidelines included, in addition to social distancing and masks, limitations on the number of people who can be at work, limitations on schooling and exams, on leisure activities, such as dining, coffee shops, and public gatherings. All of these factors adversely affected businesses (Azenkot & Botush, 2020; Dovrat-Mezeritz, 2020). In some cases, businesses that closed may not re-open, though the extent of business failures caused by the measures enacted by government is unknown at present. Still, while revenue loss is short-term, business closures have long-term effects and thus are presented in Figure 2 as a long-term implication of the government actions.

The loss of businesses combined with the restrictions imposed by the government led to widespread loss of workplaces, as noted above. While many were placed on unpaid leave, others were let go. At present, it is unclear how many of those that were placed on unpaid leave will return to full employment. Moreover, due to the economic downturn, many businesses suffered a deficit, which in many cases led to reduced wages for those salaried employees that were not forced into unpaid leave. The reduced demand for labor and economic uncertainty also led to greater labor market insecurity as jobs were placed on hold, also in the well-paid high-tech sector.

Closures, social distancing, quarantines, and guidelines preventing gatherings all led to reduced social contacts. In Israel's highly familial society, guidelines that prohibited family gatherings during the Pesach holiday as well as on weekends have widespread implications for social contacts. The closing of workplaces further limited social contacts. The limitations on travel adversely affect the options for outdoor recreation, which may have health ramifications.

Finally, the requirement for donning masks, as well as gloves and other protective gear, mostly for one-time use, has led to an increase in non-degradable waste. Thus, while the reduction in travel, particularly during the lockdown, led to reduced air pollutant and greenhouse gas emissions, this net increase in residuals has both short-term and long-term effects on the environment particularly surface water and land-based resources – thereby adversely affecting the potential benefits (ecosystem services) that accrue to humans from the environment.

Figure 2 identifies the effects of COVID-19 on the variables included in the social well-being map, briefly described above and detailed in the next section. These variables are colored orange both in Figure 2 and Figure 3, thereby connecting the two figures.

3. The Effects of COVID-19 on Personal Well-being

3.1. From National Well-Being to Social Well-Being

The previous work presented a national well-being map in which both current well-being (comprised of material conditions and quality of life factors) and indicators of future well-being resources (comprised of economic, social, human, and natural capital) were included (Ilmola-Sheppard et al., 2020). The map shows the factors that affect these 39 indicators. Ultimately 68 variables are included in this map.

While COVID-19 may well have effects also on future well-being, this study focuses on current well-being, and on social impacts. To this end, the national well-being map was modified to focus on current social well-being. In addition, some modifications were made to fit the map to the Israeli context. These are summarized in Appendix 1.

The main addition in terms of well-being indicators is *recreation opportunities*, focusing on outdoor recreation. Such opportunities are an essential factor of well-being in the modern urbanized societies (such as Israel's), where most people do not interact with nature or the outdoors as part of their daily routines (Buchecker & Degenhardt, 2015). Outdoor recreation is a function of *protected areas* (a variable added to the map), forests, and environmental assets. In the Israeli case surface, water availability is a critical component, given the long hot, dry summers – a period in which much of the outdoor recreation takes place near water (freshwater or the sea). Therefore, *surface water availability* was added to the well-being map. Outdoor recreation has positive effects on health and life satisfaction, both short-term and long-term. These connections were added to the well-being map. During the lockdown, the access to outdoor recreation opportunities in Israel was severely curtailed, and all national parks and nature reserves were closed, as well as the seashore and large urban parks.

The COVID-19 impacts are first and foremost on health. While their effects on life expectancy at the societal level are unclear at present and likely to be small, they may well affect the expectations for a healthy life, as awareness of pandemics has become much more prevalent. Therefore, life expectancy was substituted by *healthy life expectancy* in the well-being map.

The COVID-19 pandemic, and particularly the government responses to it, had a widespread effect on income and employment. These are expected to impact household expenditures. Therefore, *household expenditures* were added to the map. Expenditures are expected to impact *household debt* and *production output* (which has secondary environmental implications). Other variables that are of relevance to the case of COVID-19 effects but were not included in the national well-being map are *international travel*, *public transport*, and *family life*.

Most governments curtailed international travel as the pandemic spread. This measure has an effect both on well-being and economic activity. By limiting international travel, outgoing tourism is curtailed, thereby limiting recreation opportunities. This is most pronounced in small, densely populated countries (such as Israel), where outdoor recreation opportunities within the country are limited. International travel limitations also have an economic impact as they drastically reduce incoming tourism and reduce business interactions. While web-based interactions (such as through Zoom or Microsoft Teams) may replace some face-to-face meetings among participants who have prior relations (personally or institutionally), they cannot usually replace incidental meetings where initial contacts are often made, and which are of particular importance in

the technology field. Hence, these restrictions are likely to have long-term implications the longer the restrictions are in place.

Public transport was identified as one of the variables directly affected by governments' response to COVID-19. In Israel, train services were halted for two months, and bus services were reduced. Such measures adversely affect access to opportunities and health services, particularly of the car-less (the population that is dependent on public transport).

Family life is an important factor affecting well-being, as families serve both as social nodes and as safety nets in times of crisis. This is particularly true in familial societies such as Israel, where the short distances and culture leads to very intensive familial relations. Hence, family life was added to the map – affecting life satisfaction and social support and being affected by the intensity of social contacts, housing availability, and work-life balance.

Israel is currently experiencing a second, more massive rise in infections (Figure 1). A major question is to what extent new emergency measures will be adhered to. Moreover, Israel is in the midst of a political crisis, which affected its response in the early stages. Specifically, it led to what (Maor et al., 2020) argued is a disproportionate response. This crisis and the increasing perception that the government has failed are likely to affect the trust placed in institutions. To capture this dynamic, the *perceptions of the effectiveness of government response* to COVID-19 and the *political context* have been added.

Finally, some variables are pertinent for assessing national well-being, but not social well-being. Several of them need to be modified, as life expectancy was modified to *healthy life expectancy*. In the national well-being map, average household income was a central variable. However, on a personal level, the average household income is of little relevance. Instead, the specific household income is essential, and the variance of such income is of importance. Thus, average household income was changed to *household income*. Other variables that are pertinent at the national level but not at the local level include temperature, GHG emissions, banking sector leverage financial net worth of government and the production of fixed assets. As the well-being map is complex and challenging to follow, variables pertinent for national well-being but not social well-being were dropped out to make the map a bit more legible.

The modified social well-being map is presented in Figure 3. In this figure, the variables affected by COVID-19 and the government actions to mitigate its effects, as identified in Figure 2, are marked in orange, while the social well-being indicators are marked in yellow. Well-being indicators that are affected directly by COVID-19 are marked in orange with yellow lettering. As in Figure 2, the short-term effects of the government responses to COVID-19 are presented as hexagons, while government actions are in circles.

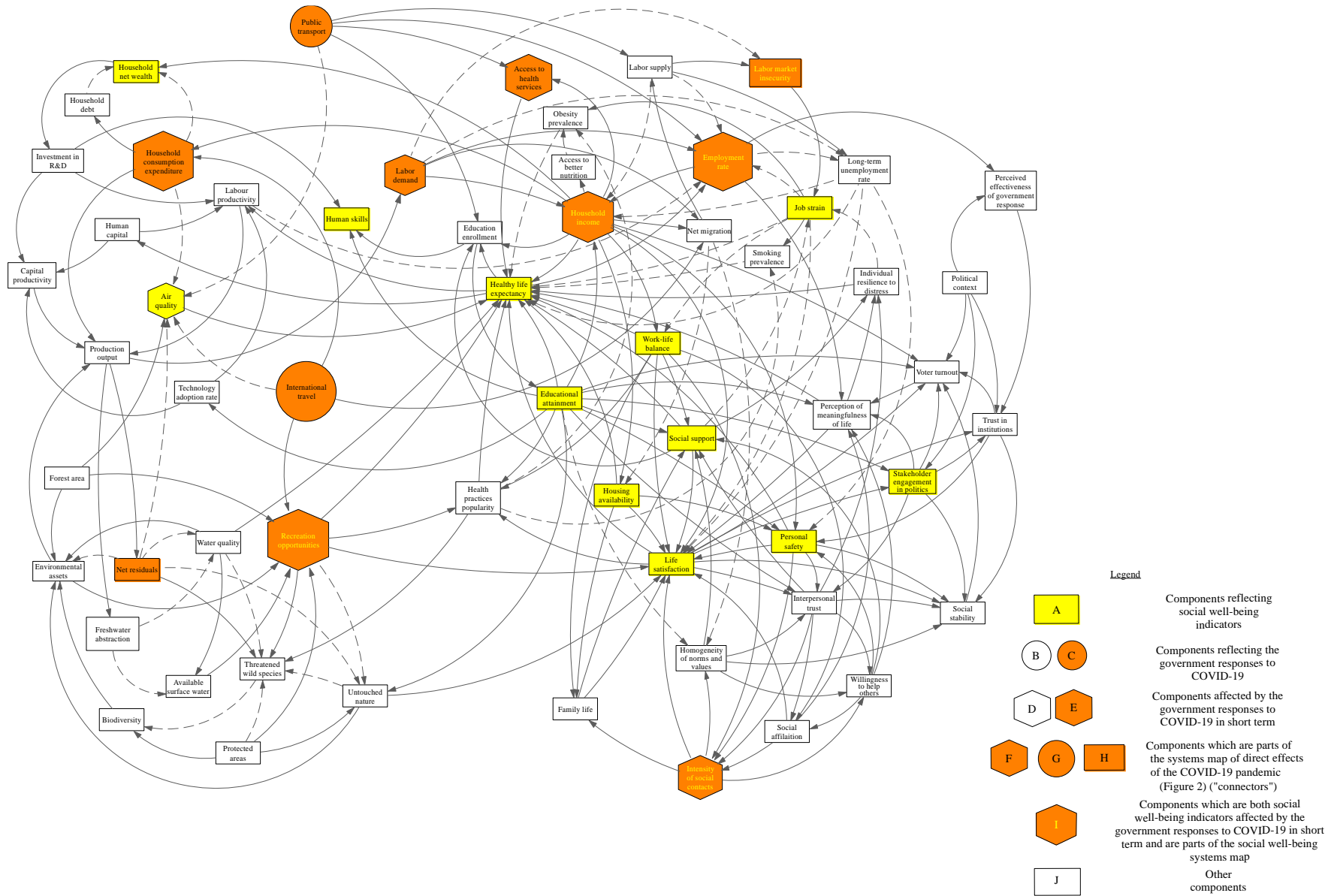


Figure 3. Modified social well-being map.
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3.2. Identification of the Effects of COVID-19 on Social Well-Being

To identify both the direct and indirect effects of COVID-19 on social well-being, first, the direct and indirect effects of COVID-19 were identified based on the social well-being map (Figures 2 and 3). Then, the variables that affect social well-being indicators (the yellow or yellow-lettered components in Figure 3) were identified in the map, and the connections between the variables affected, directly and indirectly, by COVID-19 and the social well-being indicators were made. In Table 1, the variables directly affected by COVID-19 (the orange variables in Figure 3) are presented. The effects may be felt, however, at different time frames. Thus, the second column notes whether the effects are immediate (short-term), intermediate (medium - within the timing of the exit period, 3-6 months after the first infection), or long term (beyond 6 months). The extent and direction of the effects are noted as well. Sources regarding these effects are presented in the third column. These are mostly Israeli sources pertaining to Israel. Where these were not available, we sought sources from other cases pertaining to OECD countries. In this study, we do not look at sources from developing countries due to the wide differences in settings.

Table 1. Variables affected directly (listed in alphabetical order).

Variable	Type of effect	Duration of effect	Supporting evidence
Access by public transport	-	Short-medium-long term	(Benita, 2020)
Access to health services	-	Short-term	(Efrati & Spiegel, 2020; Heath, 2020)
Employment rate	- ¹⁰	Short-term	(Bank of Israel, 2020b; Botush, 2020a; Chief Economist, 2020a, 2020b; OECD, 2020; Parger, 2020; The Israeli Employment Service, 2020; Yechiel, 2020)
Household consumption expenditure	-	Short-term	(Baker et al., 2020; Jones, 2020)
Household income	-	Short-term	(Endbald et al., 2020) ¹¹
Intensity of social contacts	-	Short-term	(BBC News, 2020; Gigi, 2020; Stotland, 2020)
International travel	-	Short-term	(Cohen, 2020)
Labor demand	-	Short-term	(The Israeli Employment Service, 2020) ¹²
Labor market insecurity	+	Short-term	(Achdut, 2020; Endbald et al., 2020; Heller, 2020)
Net residuals	+ (decreasing air pollution)	Short-term (lockdown)	(Kulkarni & Anantharama, 2020)
	- (increasing effects on water)	Medium-long term	(Boyle, 2020; The Guardian, 2020)

¹⁰ Stronger effect on weaker populations (ultra-Orthodox / Arab), low income, women, and young people.

¹¹ Decrease in household income – after different government grants/subsidies it moderates to 3-5%

¹² 90k vacancies in February, 42.5k in March, 27k in April

Variable	Type of effect	Duration of effect	Supporting evidence
	and land resources)		(Tal & Gurlik, 2020; Zambrano-Monserrate et al., 2020)
Recreation opportunities	-	Short-medium term	(Bargain & Aminjonov, 2020; Carmeli, 2020; Chilai & Eichner, 2020; USAGov, 2020)

As shown in Table 1, except for the effects on air pollution (and GHG emissions), all short-term effects are negative¹³. However, in several cases (recreation opportunities and access by public transport), they are somewhat attenuated in the medium and long term.

The social well-being map (Figure 3) also allows tracing indirect effects of COVID-19. To identify those, the (forward) uses tree of the Vensim software was applied. The results are presented in Table 2. These effects are divided into *primary effects* (variables affected by the directly affected variables, specified in Table 1) and *secondary effects* (variables affected by the primary variables). For some variables, there are no sources, and field surveys using questionnaires will be needed. These are noted. A study aimed at assessing these variables for the Israeli case has now been initiated.

Table 2. Indirect effects of COVID-19. Variables are listed in alphabetical order.

Variable	Affected by ¹⁴	Type of net effect ¹⁵	Duration of effect	Supporting evidence
Primary effects				
Access to better nutrition	Household income	-	Medium-long term	(questionnaire)
Air quality	International travel	+	Short-term	(Mahato et al., 2020; Zambrano-Monserrate et al., 2020)
	Household consumption expenditure	-	Medium-long term	(Egei-Shai, 2020; Levi et al., 2020)
	Net residuals			
Public transport				
Available surface water	Net residuals	-	Long-term	-
Educational enrollment	Household income	-	Long-term	(Ilan, 2020)
	Public transport			

¹³ Although formally *labor market insecurity* is affected positively, it itself is a negative development

¹⁴ For primary effects only variables from Table 1 are listed and for secondary effects only variables affected primarily are listed

¹⁵ Overall effect propagated from *COVID-19: number of cases* variable to the target variable

Variable	Affected by¹⁴	Type of net effect¹⁵	Duration of effect	Supporting evidence
Environmental assets	Net residuals	-	Medium-long term	(Le Quéré et al., 2020; Mooney et al., 2020; Tollefson, 2020; Wang & Su, 2020)
Family life	Intensity of social contacts	-	Short-term	(Nicola et al., 2020) ¹⁶
Healthy life expectancy	Access to health services Household income Recreation opportunities	-	Medium-long term	(questionnaire)
Healthy practices popularity	Recreation opportunities	-	Short-term	-
Homogeneity of norms and values	Intensity of social contacts	-	Long-term	-
Household debt	Household consumption expenditure	+	Medium-long term	(Botush, 2020b)
Household net wealth	Household income Household consumption expenditure	-	Medium-long term	(Bank of Israel, 2020a)
Housing availability	Household income	-	Long term	(Del Giudice et al., 2020 ¹⁷ ; Nicola et al., 2020)
Job strain	Labor market insecurity	+	Short-medium term	(questionnaire)
Labor supply	Public transport	-	Short-term	(Biddle et al., 2020) ¹⁸
		+	Medium-long term	

¹⁶ Increasing levels of family violence, which includes physical, emotional and sexual abuse

¹⁷ Housing prices drop of 4.16% in the short-run and 6.49% in the mid-run (late 2020–early 2021).

¹⁸ Mostly females need to stay home and do non-paid work/ childcare

Variable	Affected by¹⁴	Type of net effect¹⁵	Duration of effect	Supporting evidence
Life satisfaction	Household income Intensity of social contacts Recreation opportunities	-	Medium-long term	(Sugawara & Masuyama, 2020)
Long-term unemployment rate	Employment rate Labor demand	+	Long-term	(Bank of Israel, 2020a; International Labour Organization, 2020)
Net migration	International travel Household income Labor demand	- (international travel bans)	Short term	(World Bank Group, 2020) ¹⁹ (Magen, 2020)
Perception of meaningfulness of life	Employment rate	-	Long-term	(questionnaire)
Perceived effectiveness of government response	Employment rate	-	Short-term	-
Personal safety	Household income	-	Long-term	(Ministry of Homeland Security, 2020) ²⁰
Production output	Household consumption expenditure	-	Medium-long term	(Baqae & Farhi, 2020; Maliszewska et al., 2020)
Threatened wild species	Net residuals Recreation opportunities	-	Short-term	(Marshall, 2020; Spiegel & Schwartz, 2020)
Untouched nature	Net residuals	+	Short-term	

¹⁹ Flow will fall. No immediate decrease in the net stock of migrants (Migrants can't leave and go back to their homelands)

²⁰ Most of the countries observed decline in crimes, but in several there was an increase, and in different types of crimes

Variable	Affected by¹⁴	Type of net effect¹⁵	Duration of effect	Supporting evidence
	Recreation opportunities	-	Medium-long term	(Zambrano-Monserrate et al., 2020) ²¹
Voter turnout	Household income	-	Medium-term	-
Water quality (in surface water)	Net residuals	+	Short-medium term	(Yunus et al., 2020; Zambrano-Monserrate et al., 2020; Hallema et al., 2020) ²²
Willingness to help others	Intensity of social contacts	-	Short-medium term	(questionnaire)
Work-life balance	Household income	-	Short-medium term	(Del Boca et al., 2020) (questionnaire)
<i>Secondary Effects</i>				
Biodiversity	Threatened wild species	+	Short-term	(Corlett et al., 2020) ²³
Educational attainment	Educational enrolment	-	Long-term	(Azevedo et al., 2020)
Freshwater abstraction	Production output	-	Medium-term	-
Human capital	Healthy life expectancy	-	Long-term	-
Human skills	Educational enrolment	-	Long-term	-
Individual resilience to distress	Perceptions of meaningfulness of life	-	Long-term	(Shapiro et al., 2020)
Interpersonal trust	Homogeneity of norms and values Life satisfaction Personal safety	-	Medium-term	(questionnaire)
Investment in R&D	Household net wealth	-	Long-term	-
Labor productivity	Healthy life expectancy	-	Long-term	-

²¹ Clean beaches

²² Improvement of urban water

²³ Short-term improvements were found in terms of biodiversity. But the threat to endangered species has not disappeared, while enforcement efforts have been weakened.

Variable	Affected by¹⁴	Type of net effect¹⁵	Duration of effect	Supporting evidence
Obesity prevalence	Access to better nutrition Health practices popularity Job strain	+	Medium-term	(Nemet, 2020; Pietrobelli et al., 2020)
Smoking prevalence	Job strain Health practices popularity	+	Medium-long term	(Mosses, 2020)
Social affiliation	Willingness to help others Work-life balance	-	Long-term	-
Social stability	Homogeneity of norms and values Life satisfaction Personal safety	-	Long-term	-
Social support	Family life Homogeneity of norms and values Willingness to help others Work-life balance	-	Medium-term	(El-Zoghby et al., 2020; Zhang & Ma, 2020)
Stakeholder engagement in politics	Life satisfaction	-	Long-term	-
Trust in institutions	Life satisfaction	-	Medium-long term	(Blander, 2020; Herman & Anavi, 2020) ²⁴

²⁴ During the first wave the trust in politicians increased, especially in higher-income populations

Variable	Affected by ¹⁴	Type of net effect ¹⁵	Duration of effect	Supporting evidence
	Perceived effectiveness of government response			(Brück et al., 2020; Funk, 2020; Ostfeld, 2020; Shulman, 2020) ^{25 26}

The effects detailed in Tables 1 and 2 specify the variables affected, directly or indirectly, by COVID-19, whether in the short, medium, or long-term. However, the purpose of this study is to identify the effects on well-being. The (backward) causes tree in Vensim is used to identify the variables that affect the personal well-being indicators. Then, the extents to which they are affected by variables affected by COVID-19 (as specified in Tables 1 and 2) are presented. These are specified in Table 3. In the first column, the well-being indicators are specified. The second column notes whether they were affected directly by COVID-19 (the orange polygons with yellow text in Figure 3). In the third and fourth columns, the mediating variables are specified. That is, which of the variables affected by COVID-19 as specified in Tables 1 and 2 affects the relevant well-being variable and whether it is the first-order or second-order effect. In the fifth column, the type of net effect by COVID-19 is listed. Finally, in the last column, the assessed time frame of the effect is specified. This assessment is of the authors.

Table 3. The factors affecting well-being variables (listed in alphabetical order). In the case where a variable is not affected directly, only variables directly affected themselves are listed under affecting variables.

Variable	How is affected	Variables affecting (first order)	Variables affecting (second order) ²⁷	Type of effect	Duration of effect
Air quality	Indirectly	Net residuals		+	Short-term
		Household consumption expenditure		-	Medium-long term
Educational attainment	Indirectly	N/A	Household income Public transport	-	Long-term
Employment rate	Directly	Business failures Labor demand		-	Short-term
Healthy life expectancy	Indirectly ²⁸	Access to health services Household income	Employment rate Intensity of social contacts	-	Medium-long term

²⁵ Correlation between countries that have successfully dealt with the virus and a high level of trust in institutions

²⁶ Those who have had contact with sick people and those that are unemployed exhibit lower trust in people, institutions, and in general. Not personal health concern, but rather increased levels of worry and stress.

²⁷ Only for indirectly affected indicators

²⁸ Immediate impact of direct health-related effects of COVID-19 (i.e., hospitalizations and recuperations) is separated in this case

Variable	How is affected	Variables affecting (first order)	Variables affecting (second order)²⁷	Type of effect	Duration of effect
		Recreation opportunities	International travel Labor demand Labor market insecurity Public transport		
Household income	Directly	Access to workplaces Business losses Employment rate Labor demand Working days		-	Short-term
Household net wealth	Indirectly	Household income Household consumption expenditure	Employment rate International travel Labor demand	-	Medium-long term
Housing availability	Indirectly	Household income	Employment rate International travel Labor demand	-	Long-term
Human skills	Indirectly	N/A	Household income Public transport	-	Long-term
Intensity of social contacts	Directly	Closures Government guidelines Quarantines		-	Short-term
Job strain	Indirectly	Labor market insecurity	Labor demand	+	Short-medium term
Labor market insecurity	Directly	Labor demand		+	Short-term
Life satisfaction	Indirectly	Household income	Employment rate International travel	-	Medium-long term

Variable	How is affected	Variables affecting (first order)	Variables affecting (second order)²⁷	Type of effect	Duration of effect
		Intensity of social contracts Recreation opportunities	Labor demand Labor market insecurity Net residuals		
Personal safety	Indirectly	Household income	Employment rate Intensity of social contacts Labor demand	-	Long-term
Recreation opportunities	Directly	Closures International travel		-	Short-medium term
Social support	Indirectly	N/A	Household income Intensity of social contacts	-	Short-medium term
Stakeholder engagement in politics	Indirectly	N/A	Household income Intensity of social contacts	-	Long-term
Work-life balance	Indirectly	Household income	Employment rate Labor demand Labor market insecurity	-	Short-medium term

As shown in Table 3, several effects were felt within the first three months, the first wave of the pandemic. These include employment-related effects, i.e., labor demand, employment rate, labor market insecurity, work-life balance, and household income, which is directly affected by the labor market and employment options. Other variables that are also expected to be affected already in the short-term are recreation options and the intensity of social contacts that, in turn, affects social support. On the environmental side, the reduction in traffic and economic activity is expected to have a positive effect on air pollution (and GHG emissions), but as the extent of non-recycled packaging materials, masks, and other medically related equipment surges, the extent of net residuals is expected to rise, and hence environmental assets to decline. If public transport use continues to be adversely affected, private car use can increase, thereby worsening air pollution.

Some well-being indicators can be expected to be affected in the medium term. These are healthy life expectancy and household net wealth. While healthy life expectancy can be viewed as a long-term indicator, it is directly affected by many factors, as can be visually seen in Figure 3, and is thus likely to be affected already in the mid-term. Household net wealth is likely to be affected after income drops for several months.

Other well-being variables will be affected, if at all, only in the long term (over nine months since the outbreak, and in practice perhaps much longer). These include the effects on education and skills, life satisfaction, housing, personal safety, and political involvement. Whether both the short-term and, to the extent possible, the long-term effects on well-being eventually materialize is analyzed section 3.4, focusing on the Israeli case.

3.3. Amplifying Effects

The COVID-19 effects, as traced in Table 3, were unidirectional. That is, they outline how factors affected by COVID-19 affect well-being indicators. However, one of the major benefits of the systems approach, as presented in Figure 3, is the ability to identify loops whereby there are synergic effects that amplify the initial effect (or mitigate it). As there are a vast number of possible loops, we outline in Figure 4, just a few that are among those most likely to be pertinent. Clearly, there are hundreds of additional possible loops, though the likelihood of many of them to have a perceptible impact is low (as some of the relationships among their components are weak).

In Figure 4, two main, though inter-related, loops are presented, based on Figure 3. The first (R1A, R1B) is an economic loop. Essentially, as labor demand declines following the direct effects of COVID-19, as presented in Figure 2, so does household income (further amplified due to the decline in employment rate, which reduces the likelihood of finding a job, and hence pushes wages downward – see R1B). The decline in income leads to reduced private consumption (household expenditures). The reduced consumption leads to reduced production, which in turn further reduces labor demand (R1A).

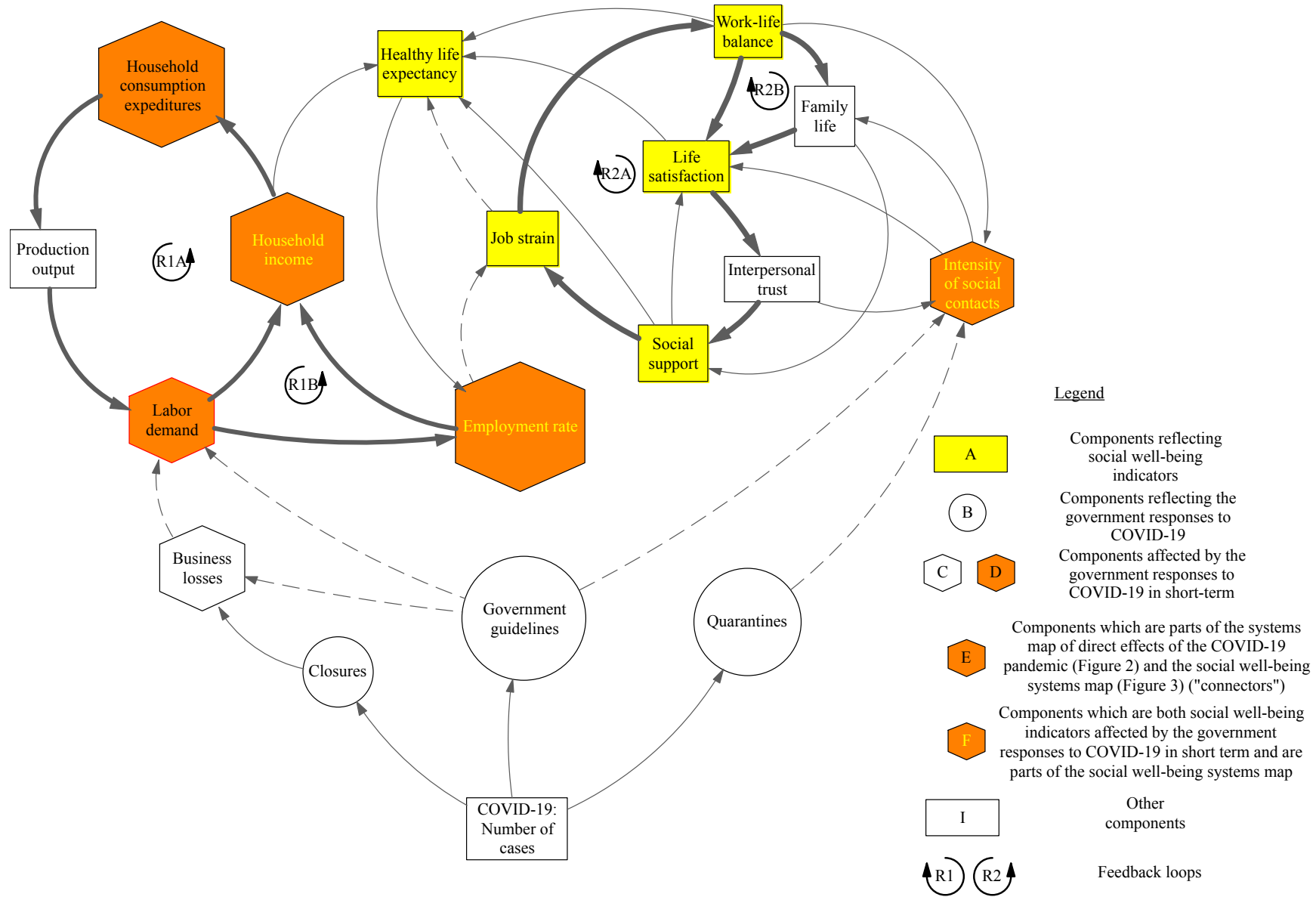


Figure 4. Exemplary feedback loops.
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The second loop (R2) has to do mainly with social effects. The limitations on social contacts adversely affect family life (particularly in societies with wide familial networks, such as Israel) and reduce life satisfaction. Lesser familial relations reduce life satisfaction and social support. Lesser life satisfaction reduces interpersonal trust, as social capital is eroded, which leads to reduced social support. Loss of social support increases job strain, as does the fall in the employment rate. Greater job strain adversely affects work-life balance, thereby further straining family life (R2B) and reducing life satisfaction (R2A).

By following these loops, we can see that the effects on social well-being indicators are wider than those specified in Table 3. For example, healthy life expectancy is a function of income, job strain, life satisfaction, social support, and work-life balance. The synergistic effects between these variables increase the overall effects on healthy life expectancy beyond the direct effect of each variable. More importantly, as most loops amplify over time, as some of the variables are affected only in the long term, these loops imply that the effects are not likely to attenuate quickly, even if a vaccination is found and the pandemic is brought under control. Rather, the effects are likely to reverberate through the socio-economic for a long period of time with long-term consequences.

3.4. The Well-being effects of COVID-19: The Israeli Case

As noted above, Israel reacted fast to the outbreak, limiting international travel. However, as flights from the USA were allowed to continue and Israelis returned from abroad, the pandemic began to spread, leading the government to impose a month-long full lockdown and restrict employment to 30% and later 15% of employees, limit rail travel, ultimately cutting it off for two months and limiting public transport availability. As most businesses were forced to close or reduce the extent of doing business unless they could shift to remote work, many employees were sent on unpaid leave (Achdut, 2020). Even when the lockdown ended, many businesses could not return to the previous business level, not least due to lower demand.

From a well-being perspective, the implications of this state of affairs, detailed conceptually in Figure 2, was that all the directly affected well-being variables (those marked with orange background and yellow lettering) were negatively affected. As the employment rate deteriorated, labor market insecurity increased, as many people were not assured that their employment would continue and, if sent on paid or unpaid leave, whether they will have a place to come back to (Bank of Israel, 2020c; Parger, 2020). This is particularly true as it is unclear to what extent businesses that have closed or retracted will re-open or continue to operate. Thus, not only employees are affected but also business owners and self-employed persons. As businesses closed or sent employees on unpaid leave, household incomes dropped (Bank of Israel, 2020c). In some cases, the economic crisis led businesses to cut salaries as business (and owners') revenues fell.

The two additional well-being variables affected either directly by the pandemic or by the initial government response were *recreation opportunities* (Bargain & Aminjonov, 2020) and *healthy life expectancy*²⁹. As part of the lockdown, residents were restricted from beaches and parks, including national parks and nature reserves. While there is evidence that the lockdown was favorable to wildlife (Marshall, 2020; Spiegel & Schwartz, 2020), as nature was largely undisturbed, the ability of people to undertake physical activities was

²⁹ The healthy life expectancy of those who were infected is seen in Figure 2 as a direct effect. However, for those that were not infected (which are the vast majority) healthy life expectancy is an indirect effect, as seen in Figure 3, and it is thus labeled both as a direct effect (in parenthesis) and indirect effect in Table 3.

restrained. Even as parks and beaches were re-opened, the overall set of opportunities remained constrained as international travel remained restricted, limiting non-local opportunities. Moreover, restrictions on the number of visitors remain in some cases (mainly national parks and nature reserves), and many beaches and nature reserves have limitations on capacities which are reached almost daily during the summer. When combined with the concerns over the health effects of COVID-19, fueled by the government, and particularly the Prime Minister, these may impact healthy life expectancy. Moreover, as hospitals were required to form closed departments for COVID-19 patients, elective procedures were postponed (Efrati & Spiegel, 2020). The fear from contagion also kept people away from health facilities and led to delays in emergency calls (such as calls for emergency heart-related cases), which may have, in some cases, long-term health implications.

The increasing labor market insecurity is likely to have an effect on job strain (Achdut, 2020). The limitations on employment, together with the closure of the education systems, and partial re-opening later, as well as the need to find alternative employment and increasing job-related stress, are likely to affect work-life balance, as the normal balance within the households was undermined in many cases (Del Boca et al., 2020). However, both the effect on job strain and work-life balance will require empirical field-survey studies to validate and quantify. Such a study has been initiated by the Israeli National Knowledge and Research Center for Emergency Readiness.

By limiting social contacts, both during lockdowns and for those quarantined, as well as due to the limitations on large gatherings and closure of places of entertainment and restaurants/coffee shops, several well-being variables were negatively affected. Perhaps the most immediate was the ability to obtain social support (El-Zoghby et al., 2020; Zhang & Ma, 2020), whether through family connections or social networks. Social contacts, however, have broader implications as they affect life satisfaction (Sugawara & Masuyama, 2020), healthy life expectancy, and feeling regarding personal safety. Most of these effects are likely to be felt in the long run, and thus their veracity at present is hard to assess.

Other long-term well-being variables likely to be affected are partially related to the economic effects noted above. The most obvious effect is on household net wealth (Bank of Israel, 2020a). As incomes drop, households and businesses are forced in some cases to fall back on savings. Also, as the central bank reduces interest rates and income drops, the long-term net wealth is adversely affected, further reducing household consumption, worsening the business climate, and deterring businesses from re-employing personnel.

Other well-being effects that may be felt in the long-term are on *housing availability* (Del Giudice et al., 2020; Nicola et al., 2020) and *educational attainment* (and hence *human skills*) (Azevedo et al., 2020). If more households cannot finance higher education or housing, these well-being variables may be adversely affected. Nevertheless, it may be too early to assess these effects at the time of writing (six months after the outbreak in Israel).

Israel may be somewhat of a special case in terms of stakeholder engagement in politics as the pandemic broke out during a protracted political crisis. Thus, the government reactions were argued to be at least partially driven by the political concerns of the Prime Minister (Maor et al., 2020). As the second wave arose and the economic costs increased and became more evident, widespread protests broke out, ongoing at the time of writing. This is indicative of high political engagement, as well as a loss of trust in the government³⁰.

³⁰ Evidence of the implications of political context on engagement in the COVID-19 case were also found in a comparative study of responses in the Far East (e.g., Feitelson et al., 2020).

However, as the political turmoil and protests are ongoing at the time of writing, it is still too soon to fully assess their magnitude or long-term implications.

4. The Equity Effects of COVID-19 on Well-being

4.1 The Process of analysis

The effects of COVID-19 on current well-being differ across different population groups. There is evidence that suggests that one of the major effects of COVID-19 is increasing inequities (Economist, 2020). These inequities are not along the commonly analyzed lines, such as the differentiation and socio-economic stratification, lifestyle choice, or belonging (ethnic, racial, religious, etc.).

As shown in Figure 2 and Tables 2 and 3, the main short-term effects pertain to economic facets. As can be seen in Table 3, the variables that appear most frequently in the directly affected, and first order effects are household income and labor demand. Therefore, we suggest using employment and income as the main stratifying variables with respect to the sensitivity of the population to COVID-10 and related mitigation policies. Thus, we stratify the population to those affected and those that largely unaffected, at least in the short run. The effect on employment is not limited to the loss of employment, as in many cases, particularly in the private sector, the implication is a loss of security. Further stratification is the effect on mobility, which also pertains to the short term. As public transport use was limited, those dependent on it were affected, while owners of private vehicles were not.

Based on these observations, two main stratifying effects are advanced here: **income** and **labor market insecurity**, and the additional stratifying effect is **mobility** due to restrictions on public transport. On this basis, we can stratify the population into three main groups, each sub-stratified by the mobility effects. Income and employment stratify the population into those that (i) were unaffected, those (ii) whose income and job security were affected but retained their workplace, and those (iii) who lost their workplace (temporarily or permanently). These groups serve as a basis for the equity analysis. The mobility effect essentially differentiates car-owners from those that depend on public transport to reach workplaces and health facilities and is used as an additional stratifying variable for each of the three groups where applicable. COVID-19 impacts different groups differently, but some of the groups are affected almost equally (e.g., people who have lost their jobs) regardless of having a car.

Group 1: Income and employment unaffected

This group is typified by people whose income and job security were not affected and who own private cars, and thus their mobility options were unaffected too (except during lockdowns, which affect the whole population and thus do not stratify in terms of mobility). Many of these are people who can work remotely and whose workplaces were not adversely affected. This group includes thus business owners and employees of sectors that were not affected (such as pharmacies, health professionals), businesses and employees who could switch easily to remote work such as academics and many high-tech businesses and people who are in the public sector and deemed as essential personnel and thus continued to work as usual (such as policemen, military).

Group 2: Loss of job security and possibly some income

This group includes people whose workplaces are affected by COVID-19 but who did not lose their jobs. Hence, while they continue to work, they face uncertainty regarding their future employment and may face redundancy. In some cases, their income was also reduced. In the case of salaried employees, this group includes those whose wages were reduced, while in the case of business owners, this group includes owners (including self-employed workers) whose revenues fell but did not close. These include owners and employees in many retail sectors, as well as in industries that continued to operate but face greater uncertainty or losses due to the general downturn in the economy.

Groups 3: Loss of jobs

The third group includes all those whose workplaces have been forced to shut down or employees laid off due to losses suffered by their workplaces. This group also includes business owners (and self-employed) whose businesses went out of business, temporarily or permanently. They may also include people who previously were in high-income brackets, such as airline pilots. However, the majority of people in this group are in low-income brackets (Ahdut, 2020). As they become jobseekers, those who depend on public transport are further constrained in their job search by limitations on public transport.

The third group is likely to include also people who were not employed when the pandemic began and whose prospects of finding employment were vastly reduced due to the pandemic. This group includes, for example, those released from the compulsory military service during this period and students who graduate at the end of the school year.

The effects of COVID-19 on the current well-being of the three groups were analyzed in three time frames – short, medium, and long. The short time frame is within the first three months after the first case was identified. This is usually the period in which governments enacted lockdowns to overcome the first wave of COVID-19. The medium period is the period in which some exit from the first measures is enacted after infection rates declined. The third, long period, pertains to the period (1-2 years, perhaps more) during which COVID persists while the economy is at least partially operational. It is expected that during this period, international travel will continue to be constrained, and the world economy will continue to be affected. Hence, open economies (such as Israel's) will continue to be in recession. The analysis does not include the second wave in Israel yet. However, it can be hypothesized that the second wave will alter the size of the three groups as more people will be affected, but not their basic characteristics.

In Table 4, the effects of COVID-19 on the various well-being variables are noted by group, as yes (+) or no (0). That is whether that well-being variable was or not affected by COVID-19 for the specific group, given the different economic effects. The results are then described and summarized. To identify these effects, the social well-being map (Figure 3) was used. To assess the implications for those whose income and jobs were unaffected, this figure was redrafted with the income and labor-related variables shown as unaffected (that is, they are not orange). This figure is added as Appendix 2.

Table 4. The well-being effects stratified by groups (+ positively affected; 0 unaffected; - negatively affected).

Variable	Duration of effect³¹	Group 1	Group 2	Group 3
Air quality	s/m/l	+	+	+

³¹ s-short-term, m-medium-term, l-long-term

Educational attainment	l	0	0	(-) ^{***}
Employment rate	s	0	0	(-) ^{***}
Healthy life expectancy	s/m/l	-	-	-
Household income	s	0	0/(-) ^{**}	-
Household net wealth	m/l	0/+	0/-	-
Housing availability	l	0	0	-
Human skills	l	0	0	(-) ^{***}
Intensity of social contacts	s	-	-	-
Job strain	m/l	0	+	+
Labor market insecurity	s	0	+	+
Life satisfaction	m/l	0	-	-
Personal safety	l	0	0/-	-
Recreation opportunities	s/m	-	-	-
Social support	s/m	-	-	-
Stakeholder engagement in politics	l	-	-	-
Work-life balance	s/m	(-) [*]	-	-

* In cases where needed childcare was affected

** Depending on the extent to which income affected

*** Affecting mainly those who are dependent on public transport

4.2. Summary of Effects by Group and timescale

4.2.1. Group 1: employment and income unaffected

The main short-term effect on the well-being of this group is the loss of recreation opportunities. These were curtailed in the short-term due to lockdowns and the closing of parks, beaches, etc. However, these were largely re-opened in the medium term, though with some restrictions. Still, the options for recreation abroad remain limited, resulting in congestion in many domestic sites.

Another short-term effect may have been the effect on work-life balance for households with small children who were left without educational facilities. A third short-term effect may have been on healthy life expectancy, particularly if positively tested for COVID-19. This effect is not limited to the short-term as infection waves are expected to return, and in Israel, we are at present in the second upturn of infections. Thus, the effect is likely to amplify over time.

Like other groups, this group was adversely affected already in the short-term by the effects of restrictions on social interactions and the environmental effects of increased residuals due to the massive use of disposable protection gear (masks, gloves, etc.). The severance of social interactions has possible medium and long-term implications for life satisfaction, social support, interpersonal trust. As noted above, these are amplified due to the cyclical relations between them and thus may have long-term implications beyond the period in which the pandemic ranges. Lower likelihood implications may pertain to engagement in politics and perception of meaningfulness of life.

Those without a private vehicle may also be affected by more limited mobility due to the limitations on public transport, particularly in the short run.

Overall, the effects on this group are limited in the short-term, with the most important effects being related to the limitations on social interactions. The long-term implications of these limitations may be perceptible but are uncertain. Variables such as housing and education are not likely to be affected for this group. If the possibilities for spending money are curtailed due to limitations on international flights and closure of shops, cultural activities, nightlife, etc., which are primarily luxury goods, expenditures of such households may actually decline, thereby increasing their savings and household wealth (though having negative implications for the economy). Household wealth may also increase for those households whose businesses flourished due to COVID-19.

4.2.2. Group 2: Retain job/work but lose job security and/or income

Even though members of this group continue to be employed, their continued employment is threatened, and/or their income falls (due to lower revenues or wages). The loss of job security and/or income occurs already in the short run. These have implications for job strain as well as work-life balance, both of which are well-being indicators. This is true for salaried employees, independent workers, and business owners. Moreover, increased job strain and disruption of work-life balance affect life satisfaction and healthy life expectancy, and further limit social contacts, thereby aggravating the social well-being implications.

The losses of job security and/or income have implications for consumption, as households reign in their outlays given the uncertainty regarding future earnings. As noted in the previous sub-section, increasing job insecurity and income uncertainty incentivize contraction of expenditures, leading to retailing and production contraction, worsening the recession. Thereby they have macro-economic implications.

In addition, this group suffers from loss of social capital due to reduced social contacts, like group 1, with implications for life satisfaction, social support, and perceptions of meaningfulness of life. This group is also likely to have reduced healthy life expectancy, similarly to group 1, as well as have lesser recreational opportunities. However, while domestic recreational opportunities open up for group 1, this group may not utilize them due to the fiscal contraction. In this case, too, those without a private car will face limited mobility options due to the limitations on public transport.

4.2.3. Group 3: Loss of employment (unemployed or on extended unpaid leave)

This group is the group most adversely affected. The loss of jobs, extended unpaid leave, and business closures have immediate drastic effects on income. If a household has monetary reserves, it may draw on them, thereby reducing its wealth. Otherwise, it may increase debt (which will need to be repaid, even if the government supports such households). In both cases, the loss of income will lead to drastic change (reduction) in expenditures, with multiplier effects on the economy. This will lead to reduced production and labor demand, thereby widening the circle of those affected. This downturn has immediate effects on labor market insecurity and increasing job strain (even if the household members find an alternative, often lesser paying, job), as well as on work-life balance.

The loss of wealth is likely to have adverse implications for housing affordability and possibly educational attainment as teenagers, and student-aged youngsters need to seek an additional income and cannot rely on their parents. However, the data suggests that the jobs available to these age groups are among those most adversely affected (Achdut, 2020). Thus the skills of such young people may suffer, thereby adversely affecting their long-term opportunity and raising the specter of a "lost generation".

This outlook is worse for those without private means of transport, as their accessibility to jobs and opportunities is constrained by the limitations imposed on public transport.

The health implications for this group may be worse than for other groups as the loss of income may lead to reduced access to health professionals. In addition to the loss of social capital due to the reduced social contacts, this group may suffer psychological impacts, which will be seen in life satisfaction and perceived meaningfulness of life. Thus, while all groups will suffer a loss of social capital, the implications and extent of loss for this group are likely to be much more significant.

5. Conclusions

The main direct impacts of COVID-19 on well-being are the effects on the labor market and henceforth on incomes. These are felt primarily by those who lose their jobs (or businesses), and to a somewhat lesser degree by those whose jobs are imperiled or whose income falls (whether as a result of a loss of revenues for their business or due to cuts in wages due to such revenue loss). These losses of employment and income security have further effects on job strain, work-life balance, as well as longer-term effects on several additional well-being variables (housing availability, educational attainment, life satisfaction, social support, and healthy life expectancy). Thus, in the short-run, the primary policy goal is to reduce employment insecurity more than income support.³² If job insecurity is reduced, the effects of COVID-19 on life-work balance and job strain are likely to be at least partially mitigated, thereby mitigating at least to a degree the long-term adverse impacts on life satisfaction, social contacts, and healthy life expectancy, and breaking the negative cycle presented in Figure 4. Moreover, as employment is the main stratifying variable, employment retention will reduce the size of group 3 (the group that lost jobs), which is the most adversely affected group.

³² As income is a function of employment, and there is a world economic recession, the ability of government to affect income security is lesser than employment security.

Therefore, such an approach will mitigate to some extent, the adverse equity effects of COVID-19 noted in section 4. This insight should be noted in countries, such as Israel, that gave precedence to short-term income support and allowed a large percentage of the workforce to go on unpaid leave.

Employment retention also positively affects trust in government. Trust is crucially important when governments have to reverse some of the exit steps due to a second (or later third) wave of the pandemic. Without trust, the ability of the government to enact or re-enact lockdowns or other restrictions is compromised.

Some of the well-being effects have further widespread implications for other well-being variables. This is particularly noteworthy with regard to recreation opportunities. The limitations imposed on recreation opportunities and popular sports activities (such as gyms, football, etc.) have adverse effects not only on health practices but also on healthy life expectancy, life satisfaction, which in turn have secondary implications for other well-being variables. Thus, the maintenance of maximal recreation options, with social distancing, is important both in itself and due to its mitigating effects on other well-being variables. In the Israeli case, the limitations imposed on such options seem to have contributed to the loss of trust in government, which could have been avoided had recreation opportunities been better preserved.

Another factor with broad effects on well-being in the short run is the restrictions on public transport. These affect the access to jobs, recreation, education facilities, and health services of the car-less. As the lost jobs are mostly low-income jobs and the car-less are also, for the most part, low income, the question of accessibility to employment opportunities is particularly meaningful. Hence, policies should increase public transport (mainly buses) frequencies to reduce the number of passengers per vehicle, thereby allowing for social distancing within the public transport vehicle.

At present, it seems that COVID-19 will continue to have periodic outbreaks for some time, perhaps several years, until medical measures that will curb it or its effects are widely disseminated, or a substantial enough population gains immunity. Therefore, it is necessary to address also long-term personal well-being effects – even if they have not materialized yet or have materialized only in a limited manner. One such effect is educational attainment. If education attainment is compromised, households are likely to suffer very long-term adverse effects. Such losses will affect the national economy as well because the skills available will deteriorate. Educational attainment may be compromised due to reduced enrollment in higher education, particularly among young adults (in their 20s) who lost their income source. Hence, part of the support to young adults, those whose prospects are most severely restricted by the pandemic, should be in the form of scholarships for advanced education. Thus, skills will be improved while reducing unemployment of active jobseekers. This may be particularly important in Israel, where students tend to be older due to the compulsory military service.

Other long-term effects are on healthy life expectancy and social support. Both of these well-being variables have widespread implications as they affect several other well-being variables (life satisfaction, employment, job strain, work-life balance) as well as factors that are of particular importance in the case of COVID-19 such as resilience to distress, health practices, and trust (both interpersonal and in institutions).

Thus, action should be taken to address these effects. Such action can take the form of increased community support and involvement, both with regard to health and to support of adversely affected households. In societies with strong familial ties, such as Israel, special attention should be given to restrictions on family gatherings. In Israel, such restrictions caused considerable distress during the first wave.

An issue that received lesser attention is the effects on the environment, which may also affect recreation. While there were short-term environmental benefits, the extent of use of disposable masks and other

protective gear increases environmental stress, as the net residuals disposed into the environment increase. Hence, recycling of such disposable items should be instituted.

This study focuses on the individual level, focusing mainly on social aspects. However, many of the policies put in place and those proposed here have macro effects on the societal level, particularly on the economic system. This system was mapped out in previous work (Ilmola-Sheppard et al., 2020). This mapping can be used to identify the effects of COVID-19 on the economic system. Such mapping will be important when policy actions are considered to affect the policy targets noted above. In essence, policy packages have to be formed to address the adverse well-being effects of COVID-19, as identified in this report. Policy packages are: "a combination of policy measures designed to address one or more policy objectives, created in order to improve the effectiveness of the individual policy measures, and implemented while minimizing possible unintended effects and/or facilitating interventions' legitimacy and feasibility in order to increase efficiency" (Givoni et al., 2013, p.3). Thus, the next challenge is to formulate policy packages to ameliorate or at least attenuate the effects of COVID-19 on well-being.

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Appendix 1: Adjustments of the National Well-being Map to the Israeli Case

Several modifications were made in the national well-being map to suite the Israeli case study. These are summarized in the table below.

Modification	Explanation
Added <i>surface water availability</i>	In a Mediterranean climate surface water is the primary base for recreation, particularly in the hot months, as well as the basis for aquatic ecosystems.
Added <i>protected areas</i>	Given the rapid rate of development in Israel open spaces are at a premium and thus protected open spaces are critical both for nature and for recreation.
Modified <i>basic sanitation</i> to <i>tertiary sanitation</i>	Israel is a world leader in wastewater recycling, with over 85% being recycled and over 99% being treated. It is today in the process of upgrading all treatment plants to tertiary level.
Added <i>public transport</i>	In Israel public transport was substantially curtailed after the outbreak of the pandemic and hence this variable is deemed crucial to assess the impacts of COVID-19
Added <i>perceived effectiveness of government response</i>	As Israel is at time of writing in a second wave of the pandemic the effectiveness of government response is increasingly questioned, affecting trust in institutions, and therefore the ability to re-enact lock downs.
Added <i>political context</i>	As the pandemic began during a political crisis this context affects Israelis' trust in government and stakeholder engagement in politics

Appendix 2: The Unaffected Groups' Map

