Constructing personal networks in the light of COVID-19 containment measures

Emanuela Furfaro
Catholic University of Milan
Giulia Rivellini (giulia.rivellini@unicatt.it)
Catholic University of Milan
Elvira Pelle
University of Modena and Reggio Emilia https://orcid.org/0000-0002-3247-4150
Susanna Zaccarin
University of Trieste

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Constructing personal networks in the light of Covid-19 containment measures

Emanuela Furfaro*, Giulia Rivellini*, Elvira Pelle** and Susanna Zaccarin***
*Department of Statistical Science, Catholic University of Milan
**Department of Communication and Economics, University of Modena and Reggio Emilia
***Department of Economics, Business, Mathematics and Statistics, University of Trieste

Abstract

The policies for containing the spread of SARS-CoV2 virus include a number of measures aimed at reducing physical contacts. In this paper, we explore the potential impact of such containment measures on social relations of both young adults and elderly in Italy. We propose two ego-centered network definitions accounting for physical distances in light of the recent - and maybe future - COVID-19 containment measures: 1) the easy-to-reach network, that represent a nearby possible source of support in case of new lockdown; 2) accustomed-to-reach network, which include proximity and habit to meet in person. The approach used for constructing personal (ego-centered) networks on data from the most recent release of Families and Social Subject Survey allows to bring in the foreground people exposed to relational vulnerability. The analysis of the most vulnerable No alters individuals by age, gender and place of residence reveal that to be single is often associated with a condition of relational vulnerability not only among elder people, but also for young adults. Results also highlight the role of the place of residence.

Keywords - personal networks - lockdown - relational vulnerability - physical presence - support

1 Introduction

The outbreak of the SARS-CoV-2 virus and the associated coronavirus disease 2019 (COVID-19) have caused, as of September 29th, 2020, over a million deaths worldwide [33]. Within Europe, Italy was the first hit country and one of the most hardly hit: in early March 2020, Italy had already registered hundreds of deaths being the European country with the largest death-toll [32], and attracting worldwide attention [24, 7].

At the beginning of March 2020, the Italian government announced some policies to contain the spread of the SARS-CoV-2 virus. These included social distancing, the prohibition of large gatherings and the closure of schools and universities, and they targeted only those Italian territories heavily involved in the initial outbreak. On March 9th, the containment measures were extended to the entire Italy, becoming the first country to implement a national quarantine amid COVID-19. A few days later, restrictions were further sharpened with the closure of all commercial and retail businesses except those providing essential services. Shortly after, other European and extra-European countries followed with very similar policies in the attempt to contain the spread of the SARS-CoV-2 virus.

Containment policies included a number of measures aimed at reducing physical contacts, which are a necessary condition for SARS-CoV-2 transmission [17, 25], and, while schools and workplaces closures may only be short-term measures, the reduction in physical contacts is more likely to be long-term. Additionally, contact tracing practices, aimed at detecting and isolating potential positive cases, may modify the personal network of contacts both in terms of size and composition, due to a possible reduced willingness to be at risk.

The implications of the pandemic and the associated containment measures on demography, society and economy are being the object of study for many researchers, who focused on direct consequences [15, 13] as well as on indirect consequences [20, 4, 8]. Such implications also include impacts on the individuals' lifestyle and on their behaviors towards the community, that resulted in changes in the network of relations binding individuals to the people close to their everyday life, and in the availability of resources to exchange tangible and intangible support.

The international research on the determinants of demographic micro processes has convincingly shown the importance to include in the analysis not only the macro but also the meso level, represented by the "social space" of individuals. The social space takes shape in the relations inside the (immediate or extended) family, and with friends, coworkers or neighbors. It represents a resilience (anti-frailty) tool, which can activate a protective network, stimulating the ability to adapt to and to bear difficulties [2, 29]. The relevance of this level is also given by the influence that individuals have on others' decision-making process and behavior through the transfer of their subjective perceptions of values and through their availability as a resource to pursue desired goals [30, 3]. Moreover, the network of relationships, and especially its composition, is a dependable indicator of the sources, the quantity, the quality, and the types of support individuals have access to [14]. In this context, the changes in social relations induced by the COVID-19 restrictions may compromise the possibility of collaborating and of feeling emotionally and socially supported, thus reducing the ability to cope with unfavourable events and with situations of stress.

COVID-19 have proved an aging-sensitive disease, with larger percentages of deaths among the elderly. Focusing on the elderly population, recent studies on active ageing argued the importance of considering social cohesion and social support as a form of a wider social engagement and a stronger sign of an active lifestyle, underling the importance of social relations in the ageing process [1, 14, 26, 31, 18]. In countries – such as Italy - characterised by strong solidarity between generations, the role of the elderly is also often associated with

childcare activities playing a central role in support [23]. In Southern Europe and in Italy in particular there is a large amount of interactions between older adults and younger individuals [5]. This is coupled with a high prevalence of inter-generational co-residence among older adults, suggesting on the one hand a potential higher vulnerability to aging-sensitive epidemics, and on the other hand potential larger social consequences [5].

Furthermore, the literature highlighted that in situations of stress, pressure and uncertainty social relations and the social support structure may change in composition and size. The COVID-19 pandemic undoubtedly represents one of these shock events, given the transformations in everyday life, in the way of living social relations, in work habits, and in the behaviour towards community life. During the pandemic, the network of relationships have hence been influenced by both the containment measures, and the general situation of emergency and uncertainty.

This paper contributes to the recent discussion on the consequences of the containment measures by focusing on the individual relationships.

Building upon the literature on personal networks, on the basis of the most recent information on composition and characteristics of social networks in pre-pandemic time in Italy, we explore the potential impact of the containment measures on social networks. Since social networks are sources of support, often requiring geographical proximity to allow physical interactions and in-person contacts, we describe the changes in size and typology of social networks in the light of the restrictions imposed during the pandemic. We will also identify different levels of vulnerability that individuals may suffer in their relational and support sphere. On the basis of the above recalled aging-sensitive characteristics of the COVID-19 disease until now as well as the strong inter-generational interactions still persisting in Italian population, the analysis is carried out on two specific age-groups: individuals aged 18-34 ys. and individuals aged 65 ys. and over, living as single or as a partner in couple.

The remainder of the paper is organized as follows. Section 2 discusses results from the most recent available surveys on relational aspects during the pandemic carried out in Italy and in other European countries. Section 3 describes the Family and Social Subjects survey (FSS), the primary Italian data-source to build the networks of contacts individuals (egos) entertain with others. Adopting an "ego-centered network" design, with the most recent data of the pre-pandemic period, it is possible to evaluate the impact of the containment measures on individual contacts and sources of support. Results based on two different hypotheses of social interactions are presented and analysed in Sect. 4, with a focus on individuals with a higher risk of vulnerability and loneliness in case of a new emergency. Section 5 closes with concluding remarks.

2 Social relations during the lockdown in Italy

The final containment measures imposed on March 11th, 2020, included a number of measures aimed at restricting physical contacts, which are a necessary condition for SARS-CoV-2 transmission [17, 25], while promoting social distance and stay-at-home. In particular, the

Italian government closed all schools, universities and non-essential workplaces, closed all sports facilities, commercial and retail businesses except those providing essential services, prohibited public events, prohibited non-essential travels and any non-essential movement from home, including visits to family and friends, and strictly limited outdoor physical activity [1]. These restrictions have pushed the population to change their routine as well as the way in which they live their relations with relatives, friends, acquaintances and neighbors.

Several surveys have been carried out in Italy to study relational aspects during the first phases of the COVID-19 pandemic. In this section we report the main results of those surveys that we believe are useful for motivating our research and for interpreting our own analyses.

Survey results presented in the Annual Report of the Italian Institute of Statistics (Istat) highlight that most people did not receive any visits, nor went out, during a canonical day of lockdown, respecting the restriction measures [19]. The Report shows a cohesive and positive familiar environment that helped people cope with the uncertainty related to the health emergency. Relationships with cohabiting people are described as very good, as good as before the lockdown or even better, with most people being happy to entertain with household members, depicting familiar relations and affections as shelters and source of serenity during a time of uncertainty and fear. Perceiving the household environment as very good helped living positively and constructively the day, highlighting the importance of familiar ties. Regarding relations with non-cohabiting people, due to social distancing and stay at home orders, the physical contacts were forced to move to a "virtual ground". In particular, most Italians dedicated their spare time to cultivate their personal relationships. Most people spoke on the phone or through video-calls with their relatives and friends, with more than one out of two dedicating more time than usual to this activity. Some people also reported playing games online with friends, suggesting again a translation of activities from physical to virtual. These results suggest that the way of living relationships changed, but frequency of contacts did not necessarily decrease. However, the loss of physical contacts may have translated into loss of support for those who were used to receiving instrumental support through a physical presence, such as families who counted on grandparents for the care of children or elders who need for daily care.

While the results from Istat focus on the situation during the lockdown, other surveys have focused specifically on the changes in contacts which occurred during the COVID-19 pandemic [4, 11]. From April 14th to April 24th, 2020, [4] conducted an online survey that included 9,186 individuals aged 18+ ys. living in Italy, Spain and France. Information spanned on key domains of an individual's life, including type of relationships (with a focus on intergenerational relationships) and frequency of contacts. Preliminary findings show that there was a large decrease in physical contacts, with people living in Italy and Spain experiencing

[1] dpcm 23 febbario: https://www.gazzettaufficiale.it/eli/id/2020/02/23/20A01228/; dpcm 25 febbraio: https://www.gazzettaufficiale.it/eli/id/2020/02/25/20A01278/; dpcm 1 marzo: http://www.governo.it/it/articolo/coronavirus-firmato-il-dpcm-1-marzo-2020/14210; dpcm 4 marzo: http://www.governo.it/it/articolo/coronavirus-firmato-il-dpcm-4-marzo-2020/14241; dpcm 8 marzo: http://www.governo.it/it/articolo/coronavirus-firmato-il-dpcm-8-marzo-2020/14266; dpcm 11 marzo: http://www.governo.it/it/articolo/coronavirus-conte-firma-il-dpcm-11-marzo-2020/14299.

higher reductions. Moreover, inter-generational physical contacts were reduced particularly among younger adults, probably due to the wish to avoid contacts of grandchildren with older people. On the other hand, as predictable non-physical contacts have increased in all three considered countries, including those with non-relatives, other relatives and all type of relationships. The survey also allows to study support received. Their preliminary results show that a higher proportion of younger respondents reported to have received more emotional and financial support as compared to other older groups.

[11] also launched a cross-national online survey, the "COVID-19 Health Behavior Survey" (CHBS). Participants were recruited between March 12 and April 12 via targeted Facebook advertisements for a total of 53,708 participants. They were asked to report the number of social contacts they had on the day before they completed the survey. Although collecting information on contacts, the aim of their survey was epidemiological, more specifically it was to examine the implications of reduced contacts on the spread of the coronavirus. Their findings hence provide evidence on the reduction in the number of contacts which occurred in the population, but they do not allow to further study the type of relationship nor the people involved.

Given the relevance of the change in social contacts amid COVID-19, at the beginning of June, the Survey of Health, Ageing and Retirement in Europe (SHARE), which collects longitudinal data on the elderly population in Europe, started the fieldwork of a new "SHARE COVID-19 survey". The collected data will allow to study different domains of the elderly's life during the pandemic, including social networks and changes in personal contacts with family and friends, help given and received, personal care given and received during the pandemic. Note that the survey is still ongoing, yet it proves the importance of the study of social networks and the need to further collect data to investigate changes in during the pandemic. These ad-hoc surveys designed during the pandemic were aimed at quickly providing information on the number of contacts and on how social relations have changed throughout the pandemic. However, they do not always allow for an extensive and detailed study on personal networks of relationships.

In this contribution, we combine the 1) knowledge on the containment measures, 2) the results provided by the above-mentioned studies, and 3) the most recent data collected on personal networks through large scale official surveys, with the aim to elaborate new perspectives on the characteristics of personal support networks. These perspectives are mainly based on a novel use of relational information collected in the pre-pandemic period. The COVID-19 pandemic experience suggests the elaboration of new hypotheses for the construction of realistic personal support networks with the aim to identify groups of individuals at risk in case of a new emergency.

3 Ego-centered networks' approach to study social relations

Data on contacts and social relations individuals that entertain with others are often collected through large scale surveys[2]. In these surveys, an "ego-centered network" design is adopted for data collection by asking the respondent (ego) to list the names/roles of people to which they are related (alters) by some types of relationship [10, 21, 22, 27]. Alters may include a variety of people, such as partner, parents, children, siblings, friends, neighbors, colleagues an so on. Further information on the alters' characteristics (age, gender, place of residence, etc.) can also be collected to explore the characteristics of individual relations (tie) between ego and the alter. Information on the tie can also be added, such as the frequency, the duration and the intensity of the relationship.

With a focus on Italy, the Family and Social Subjects survey (FSS) carried out by the Istat (https://www.istat.it/it/archivio/185678) represents the primary statistical source to reconstruct different types of ego-centered networks [3, 2, 26]. FSS is based on a wide probability sample, allowing detailed network analyses in specific groups (by age, by living arrangements, etc.) of population. In particular, FSS survey asks for the presence (yes/not) of not-cohabiting siblings, children and grandchildren (limited to a maximum of three, with grandchildren asked only to respondents who are at least 25 ys. old), parents, and grandparents (asked only to respondents who are less than 50 ys. old), as well as the frequency of face-to-face contacts[3] respondents entertain with them and, lastly, the residential proximity[4] of siblings, children and grandchildren, and parents. An additional section collected information on the presence and, if any, type and number of other not-cohabiting relatives respondents "are close to" or "to whom they can count on", and on the presence and the number of friends and neighbors respondents "can count on if necessary." Besides the frequency of phone calls with not-cohabiting siblings, children and grandchildren, parents, and grandparents, in the last FSS edition, carried out in 2016, the frequency of video calls and messages (through sms, whatsapp, email, social networks) had been asked as well the frequency of face-to-face contacts with friends, using the same answer categories proposed for siblings, children, etc.

Combining these information, networks of contacts, potential support networks and social support networks have been defined. With data from FSS 2013, [3] studied the "Potential Support ego-centered" (PSE) network and the Effective Support Ego-Centered (ESE) network of young adults aged 18-34 ys. who are single or live with a partner. The PSE network was defined as the set of non-cohabiting people (along with their role relations) who can be a

[2]Usually multipurpose surveys on general population, e.g. European Quality of Life Survey –https://www.eurofound.europa.eu/surveys/european-quality-of-life-surveys/european-quality-of-life-survey-2016– International Social Survey Programme –http://w.issp.org– Generations and Gender Surveys –ttps://www.ggp-i.org/data/– or surveys addressed to specific age groups suche as the Survey of Health, Ageing and Retirement in Europe –http://www.share-project.org/– devoted to individuals aged 50+.

[3]The answer categories are: everyday, some times a week, once a week, some times a month but less than 4, some times a year, never.

[4]The answer categories are: in another apartment of the same building, in the same municipality, in another municipality of Italy—less than 16 km, from 16 to 50 km, more than 50 km, abroad.

possible source of support to the respondent. [3] assumed that alters with whom respondent entertained frequent contacts ("at least once in a week") and were living close (even in a different municipality but not farther than 16 km) could be reliable potential supporters. The two conditions were thought as a credible ground for the emergence of support ties. In particular, the assumption of geographical proximity was motivated by results on spatial and network analyses [12] which showed that spatial proximity and location can influence the formation and nature of social ties. Moreover, certain forms of instrumental support (child and medical care, adult assistance, housekeeping, providing meals, etc.) can be better provided if proximity as well acquaintance hold. However, during the COVID-19 emergency, geographical proximity and frequency of contacts assume a different value. In fact, the former was no more a facilitation to help provision and the latter became in turn virtual. [19] confirms that, due to the lockdown, most Italians did not visit other people and most people dedicated more time than usual to phone or video-calls with relatives and friends.

The same PSE definition was adopted with FSS 2009 to build the potential support network of individuals aged 18-44 ys living in couple to analyze the probability of receiving support from alters controlling for the social network characteristics [2].

[26] focused on individuals aged 65+ and built the elderly's ego-centered network of contacts to be considered as an explanatory variable in studying the support provided by the elder people, shedding a new light on the topic of active ageing in Italy.

Building on the above literature and using relational data from the 2016 FSS edition - the most recent available data for the pre-emergency period - in the next section we propose different hypotheses to build relational contexts in which individuals could be embedded (ego-centered networks), taking into account some of the last months COVID-19 restrictions with respect to physical distancing. From the resulting ego-network types, it is possible to derive the size and the characteristics, as well as level of vulnerability, of individuals in need of help in case of a new emergency. Since the analysis of social networks cannot disregard the age of individuals and their life course - even more in the age-sensitive pandemic situation, our analysis focuses on two different target population: individuals aged 18-34 ys. and individuals aged 65 ys. and over, both living as single or as partner in a couple.

4 Ego-centered network construction in the light of Covid-19

As discussed in the previous section, we use data from the latest edition of the FSS survey, carried out in 2016. Main socio-demographic characteristics by living arrangement of the two age groups (young adults and elderly) are reported in Table 1.

Looking at young adults, about 60% of singles are men; both singles and couples are mostly aged 25-34 ys. old and reached a good (medium or high) degree of education. As expected, almost all declare to have very good health conditions. Conversely, looking at elderly, more than 70% of singles are women. This is not surprising, considering the well known differences in terms of health and life expectancy. Looking at health conditions, elderly in couple appear to be more healthier than singles.

Table 1: Socio-demographic characteristics, % (FSS 2016)

(a) Young Adults

	Single	In couple
	34.8	65.2
Gender		
Male	60.2	51.2
Female	39.8	48.8
Age		
18-24	16.2	7.6
25-34	83.8	86.4
Health		
Good	92.9	94.5
Fair	5.6	4.8
Bad	1.5	0.7
Place of residence*		
Metropolitan area	16.5	15.4
≤10,000 inhab.	36	43.4
>10,000 inhab.	47.4	41.2
Education		
High	30	20.2
Medium	53	51.3
Low	17	28.5
Income		
Self-employed	16	12.7
Employed	62.5	63.9
Other	21.5	23.4

(b) Elderly

	Single	In couple
	36.4	63.6
Gender		
Males	28.6	52
Females	71.4	48
Age		
65-74	33.3	55.3
75+	66.7	44.7
Health		
Good	30.5	39.4
Fair	42.5	42.1
Bad	27	18.5
Place of residence*		
Metropolitan area	16.9	17.8
≤10,000 inhab.	38.4	37.4
>10,000 inhab.	44.7	44.8
Education		
High	6	6.7
Medium	17.5	20.5
Low	76.5	72.8
Income		
Pension	88.5	80.6
Other	11.5	19.4

* Place of residence is recorded in three categories: metropolitan areas, municipalities up to 10,000 inhabitants, and municipalities beyond 10,000 inhabitants. The category "metropolitan area" includes the big city at the center of the metropolitan area (Turin, Milan, Venice, Genoa, Bologna, Florence, Rome, Naples, Bari, Palermo, Catania, Cagliari) and the municipalities within the borders of the area.

With the aim to explore the potential impact of the containment measures on social relations of both young adults and elderly, we propose two ego-centered network definitions accounting for physical distances in light of the recent - and maybe future - COVID-19 containment measures.

In particular, we define a social network characterized by the physical presence of alters that live in the same municipality as ego. This network is based on the idea to draw a picture of the real availability of "easy- to-reach" alters in the personal network, that may represent a possible source of support in case of a new lockdown. In this perspective, an alter is included in the personal network of an ego if he/she lives in the same municipality, regardless of the frequency of face-to-face contacts.

Information contained in the FSS survey allow to check for the residential proximity of

different types of alters, according to the age group. More specifically, we can check for the presence of parents and siblings in the personal network of young adults, and for the presence of siblings, children and grandchildren in the personal network of elderly.

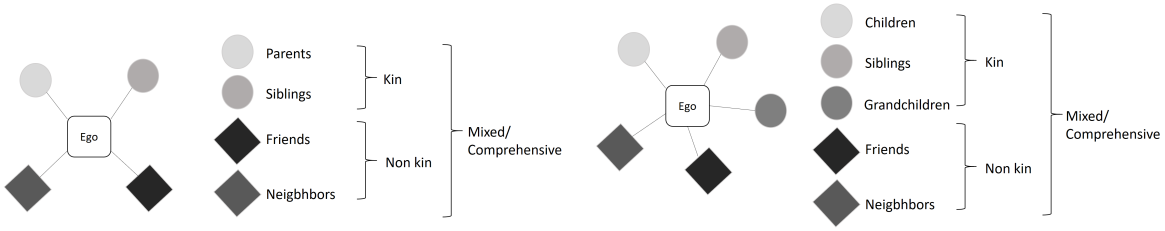
Unfortunately, the FSS questionnaire does not provide information on residential proximity of friends; however, it provides information on the frequency of face-to-face contacts. We use this frequency as a proxy of residential proximity with friends, in the sense that we assume that if ego has frequent (at least once in a week) face-to-face contacts with a friends this means that they live close by.

Furthermore, we include in the personal network neighbors to whom ego can count on in case of need, if any.

Since the resulting personal network is characterized by the physical proximity of alters, in the following we will refer to it as "easy-to-reach" network.

Thus, the "easy-to-reach" network allows the presence of four different alter roles for young adults (e.g. parents, siblings, friends and neighbors), and of five different alter roles for the elderly (e.g. siblings, children, grandchildren, friends and neighbors)[5]. Combining the alter roles, we identify four network typologies (see Figure 1): *Kin*: if alters are only in the kinship (parents/siblings or siblings/children/grandchildren); *Non kin*: if network is composed only by friends and/or neighbors; *Mixed*: if there is at least one alter belonging to the kin sphere and at least a friend or a neighbor; *Comprehensive*: if there is at least one alter from each alter's role. Individuals with no close alters are classified as "No Alters".

Figure 1: "Easy-to-reach" network by alters role



(a) Young adults (b) Elderly

In order to deepen the study on the personal support network in which young adults and elderly can be embedded in a possible new emergency situation, we decide to add information on the frequency of face-to-face contacts as an additional constraint for the network construction. In particular, an alter is included in the personal network of an ego if he/she lives in the same municipality and has frequent face-to-face contacts with ego (at least once in a week). As we added the habit to frequently meet and spend time together, we will refer to this personal support network as "accustomed-to-reach" network. The rationale behind these network construction assumptions is that it is more likely that alters embedded in the

[5]Unfortunately, FSS questionnaire does not provide sufficient information to make any assumption on the residential proximity of other relatives.

"accustomed-to-reach" network can represent a possible source of support in situations of reduced possibility to travel (e.g. a new lockdown) with respect to the "easy-to-reach" network. Indeed, the habit to frequently meet may reduce the possible embarrassment the ego can feel in asking help in case of need.

As mentioned in Section 3, FSS qestionnaire provides information on both the residential proximity and frequency of face-to-face contacts only for the alters belonging to the kin sphere. Thus, we check for the residential proximity and frequent face-to-face contacts for parents and siblings to build the "accustom-to-reach" network of young adults, and for the residential proximity and frequent face-to-face contacts of siblings, children and grandchildren for elderly.

Conversely, assumptions on friends and neighbors are the same as in the "easy-to-reach" network.

Analogously to the "easy-to-reach" network, we combine the alter roles in order to identify four network typologies: *Kin, Non kin, Mixed* and *Comprehensive*.

In the next section, we provide some descriptive results on the personal networks built following the above described steps. All results are presented considering the two age groups (young adults or elderly), the living arrangements (single or in couple) and gender.

4.1 The "easy-to-reach" network

The "easy-to-reach" network highlights the physical presence of alters. These may represent a source of support in situations of reduced possibility to travel. This network should be thought of as a network of potential physical and immediate support, and not necessarily as the network of people that are accustomed to providing support to ego.

Table 2 shows the distribution of the number of different roles in the young adults' social networks and in the elders'. These tables allow to understand the heterogeneity of the alters roles, which is an important characteristics to take into account when studying social networks. In fact, different roles may be a source of different types of support. Regarding gender, in the observed sample, women seem to have a larger availability of alters with different roles, while, when in couple, the gender differences are smaller. Focusing on age, the availability of alters in different role relations is similar among the two considered age groups. The group of physically isolated people is represented by those having no different role relations in their network (row 1 of Tables 2a and 2b). Generally, men seem more frequently physically isolated.

Table 3 reports the network size by alters role. It provides insights not only on the heterogeneity of the network, but also on the size of the networks by the different roles. Focusing on young adults, the main observed difference is in the availability of friends. In fact, singles have more often more friends living nearby than couples have. The main gender differences are observed with regard to neighbours, with women having more often neighbours to count on. Looking at the elderly population, the average number of friends living nearby drops consistently both for women and men, in couple and single. Conversely, the number, as well as the frequency, of first-degree relatives is similar between young adults and elderly.

Table 2: Distribution of number of different roles - "easy-to-reach" network

(a) Young Adults

	Single		In couple	
	Males	Females	Males	Females
0	12.9	7.5	13.7	11.7
1	22.8	24.5	19.5	24.5
2	28.2	22.6	34.8	31.6
3	22.4	27.0	18.6	19.6
4	13.7	18.2	13.4	12.5

(b) Elderly

	Single		In couple	
	Males	Females	Males	Females
0	14.6	9.2	9.8	10.8
1	25.0	19.8	17.1	18.3
2	27.8	29.3	25.8	27.0
3	19.7	24.8	26.7	25.2
4	10.0	11.6	14.6	13.6
5	3.0	5.3	6.1	5.1

Last, Table 4 illustrates the observed distribution of the "easy-to-reach" network typologies. Single young men are mainly embedded in a *Non kin* network, with 4.3 alters on average. Single young women, who have a slightly larger presence of family members, are slightly more often embedded in a *Mixed* network, with availability of 6 alters on average. In general, regardless of gender and living arrangements, the two most common typologies are either the *Non kin*, driven by the presence of friends, or *Mixed*, when the presence of friends is also coupled by the presence of the family. Focusing on the elderly population, regardless of gender and living arrangements, most people are embedded in either a *Kin* network or a *Mixed* network, denoting the constant presence of family members in the neighbourhood. The average size of the former is always higher than that of young adults, possibly denoting the closeness of the whole family of their kids. Single elder males are found to be physically alone more often than any other group.

4.2 The "accustomed-to-reach" network

The "accustomed-to-reach" network highlights not only the physical presence of alters, but also the habit of meeting and spending time together. These most likely already are a source of support for the respondents, and, due to their physical proximity, they can keep representing an effective source of support in situations of reduced possibility to travel. Results on this network are related to the "easy-to-reach" network in the sense that we expect these networks to be "smaller" than the "easy-to-reach". For instance, if a respondent had an empty "easy-to-reach" network, the "accustomed-to-reach" network will again be empty, while if the respondent had a non-empty "easy-to-reach" network because he/she did have some relatives living in the neighbourhood, the "accustomed-to-reach" network may be empty if these

Table 3: Network size by alters role - "easy-to-reach" network

(a) Young Adults

	Single (Males)			Single (Females)			In couple (Males)			In couple (Females)		
	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median
Parents	49.4	0.9 (0.93)	0	56	1 (0.96)	1	49.3	0.9 (0.95)	0	47.3	0.8 (0.93)	0
Siblings	34.9	0.4 (0.67)	0	42.8	0.6 (0.77)	0	44.7	0.6 (0.81)	0	37.6	0.5 (0.80)	0
Friends	68.9	2.9 (3.05)	2	68.6	2.7 (2.81)	2	56.7	2.2 (2.80)	1	55.6	2.1 (2.62)	1
Neighbors	48.1		0	56.6		1	47.9		0	56.1		1

(b) Elderly

	Single (Males)			Single (Females)			In couple (Males)			In couple (Females)		
	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median
Children	43.9	0.7 (0.92)	0	58.9	1 (0.97)	1	61.8	1 (0.92)	1	60.8	1 (0.93)	1
Siblings	38.9	0.6 (0.92)	0	37.4	0.6 (0.92)	0	44.7	0.8 (0.98)	0	40.7	0.7 (0.97)	0
Grandchildren	34.8	0.7 (1.1)	0	48	1 (1.19)	0	48.8	1 (1.17)	0	48.7	1 (1.19)	0
Friends	31.8	1.1 (2.21)	0	30.7	0.9 (1.84)	0	31.6	1.1 (2.17)	0	28.7	1 (2.12)	0
Neighbors	45.4		0	50.7		1	50.7		1	48.7		0

relatives are hardly ever met[6]. Table 5 illustrates such differences. In particular, note that the percentage of elder single men, that are not only physically, but also socially isolated goes from 14.6% to 17.6%.

Table 6 is the counterpart of Table 3 (friends and neighbors are not reported here since the same assumptions of the "easy-to-reach" network hold for these alters). Regardless of age, gender and living arrangement, the major differences regard the frequency of physical contacts with siblings, which drop in all considered groups. Grandchildren, if present, seem

[6]Hypotheses on friends and neighbours did not change with respect to the "easy-to-reach" network.

Table 4: Distribution of network typologies (mean network size and standard deviation) - "easy-to-reach" network

(a) Young Adults

	Single		In couple	
	Males	Females	Males	Females
No Alters	12.9% (0)	7.5% (0)	13.7% (0)	11.8% (0)
Kin	9.1% (2.3; SD 0.99)	10.1% (2.4; SD 1.15)	14.8% (2.6; SD 1.24)	14.4% (2.7; SD 1.27)
Non kin	34.0% (4.3; SD 3.13)	30.2% (3.3; SD 2.67)	26.9% (4.2; SD 3.29)	35.5% (3.7; SD 2.81)
Mixed	30.3% (5.8; SD 2.62)	34.0% (6.0; SD 2.75)	31.2% (5.1; SD 2.45)	25.8% (5.3; SD 2.36)
Comprehensive	13.7% (9.2; SD 2.98)	18.2% (8.8; SD 2.62)	13.4% (8.1; SD 2.39)	12.5% (7.8; SD 2.49)

(b) Elderly

	Single		In couple	
	Males	Females	Males	Females
No Alters	14.6% (0)	9.2% (0)	9.8% (0)	10.8% (0)
Kin	30.6% (3.1; SD 1.98)	34% (3.5; SD 1.98)	32.1% (3.8; SD 2.13)	34.8% (3.7; SD 2.12)
Non kin	19.1% (2.6; SD 2.37)	15.7% (2.7; SD 2.47)	13% (2.5; SD 2.38)	14.7% (2.7; SD 2.51)
Mixed	32.7% (5.5; SD 3.0)	35.9% (5.2; SD 2.52)	39% (5.6; SD 2.74)	34.6% (5.6; SD 2.79)
Comprehensive	3% (10.1; SD 3.95)	5.3% (9.7; SD 2.57)	6.1% (9.9; SD 2.91)	5.1% (10.2; SD 3.47)

Table 5: Distribution of number of different roles - "accustomed-to-reach" network

(a) Young Adults

	Single		In couple	
	Males	Females	Males	Females
0	14.5	9.4	15.6	12.5
1	24.1	27.0	20.0	24.5
2	29.5	25.8	35.1	31.6
3	20.3	21.4	17.3	19.8
4	11.6	16.4	12.1	11.5

(b) Elderly

	Single		In couple	
	Males	Females	Males	Females
0	17.6	11.1	12.4	13.2
1	27.6	23.1	19.6	20.9
2	30.2	31.8	28.7	29.2
3	15.9	20.3	22.5	20.8
4	6.8	9.9	12.4	12.4
5	1.9	3.6	4.3	3.5

to entertain physical contacts with their grandparents, except for single men, who seem less

accustomed to meeting with their grandchildren.

Table 6: Network size by alters role - "accustomed-to-reach" network

(a) Young Adults

	Single (Males)			Single (Females)			In couple (Males)			In couple (Females)		
	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median
Parents	44.4	0.8 (0.92)	0	47.2	0.9 (0.95)	0	47.1	0.9 (0.94)	0	46	0.8 (0.92)	0
Siblings	29	0.4 (0.62)	0	35.8	0.5 (0.73)	0	38.4	0.5 (0.79)	0	35.5	0.5 (0.78)	0

(b) Elderly

	Single (Males)			Single (Females)			In couple (Males)			In couple (Females)		
	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median	%	Mean (sd)	Median
Children	40.3	0.6 (0.87)	0	57.3	0.9 (0.94)	1	59.2	0.9 (0.91)	1	59.1	0.9 (0.92)	1
Siblings	27.6	0.4 (0.80)	0	24.7	0.4 (0.78)	0	28.7	0.5 (0.83)	0	26.9	0.4 (0.83)	0
Grandchildren	27.4	0.6 (1.01)	0	42.3	0.9 (1.14)	0	45.5	0.9 (1.15)	0	45.4	0.9 (1.16)	0

Last, Table 7 provides the distribution of network typologies. The major difference is the increase in the percentage of those who have a No Alters network. The most common typologies are again the *Non Kin* and the *Mixed* for the young adults and *Kin* and *Mixed* for the elderly. The sizes are very similar to the "easy-to-reach" network, suggesting that those who have significant others in their proximity, are also accustomed to seeing them. The major difference concerns again single elder men that, as mentioned earlier, are alone more often than other groups.

4.3 The No Alters individuals: focus on relational vulnerability

The approach used in the previous analyses allows to bring in the foreground people exposed to a "relational" vulnerability. According to [28] the "vulnerability identifies a situation that is characterized by a state of weakness which exposes a person (or a family) to suffering particularly negative or damaging consequences if a problematic situation arises". If social vulnerability includes aspects connected to financial situation, housing condition, employ-

Table 7: Distribution of network typologies (mean and standard deviation) - "accustomed-to-reach" network

(a) Young Adults

	Single		In couple	
	Males	Females	Males	Females
No Alters	14.5% (0)	9.4% (0)	15.6% (0)	12.5% (0)
Kin	7.5% (2.3; SD 0.96)	8.2% (2.1; SD 0.95)	12.9% (2.6; SD 1.19)	13.6% (2.7; SD 1.25)
Non kin	37.8% (4.1; SD 3.04)	38.4% (3.5; SD 2.67)	28.8% (4.1; SD 3.24)	35.8% (3.7; SD 2.81)
Mixed	28.6% (6; SD 2.65)	27.7% (6.0; SD 2.71)	30.7% (5.1; SD 2.41)	26.6% (5.3; SD 2.29)
Comprehensive	11.6% (9.4; SD 3.06)	16.3% (9; SD 2.62)	12% (8.4; SD 2.29)	11.5% (7.8; SD 2.56)

(b) Elderly

	Single		In couple	
	Males	Females	Males	Females
No Alters	17.6% (0)	11.1% (0)	12.4% (0)	13.2% (0)
Kin	27.6% (2.7; SD 1.78)	32.1% (3; SD 1.8)	29.4% (3.4; SD 1.93)	32.4% (3.4; SD 1.94)
Non kin	22.5% (2.6; SD 2.37)	18.5% (2.6; SD 2.42)	16.7% (2.7; SD 2.6)	17.3% (2.7; SD 2.56)
Mixed	30.4% (5.3; SD 3.05)	34.7% (5.1; SD 2.5)	37.2% (5.5; SD 2.81)	33.6% (5.5; SD 2.76)
Comprehensive	1.9% (9.5; SD 3.89)	3.6% (9.4; SD 2.97)	4.3% (9.3; SD 2.78)	3.5% (10.7; SD 3.5)

ment, management of care for children and dependent persons, the relational vulnerability focuses more on the social space of relationships, that is recognized, as mentioned at the beginning of the paper, a resilience tool for most people. The relational vulnerability can be characterized by some basic elements: a) the lack of available others to whom one can turn if needed; b) a degree of dissatisfaction with the available support; c) the lack of strong or weak ties; d) the perception of loneliness. This vulnerability does not necessarily identifies trajectories of grave loneliness or state of need, but a high degree of exposure to serious damage. That is particularly true in case of large-scale disasters – such as pandemic of infectious diseases, terrorist attacks or natural disasters - causing a significant loss of lives, property damage, and adverse social and economic impact [9]. Usually in such situations the main concern is the identification of frail individuals, who - regardless of the differing definitions of frailty - show physical, cognitive/psychological, nutritional and social traits, as well as ageing and disease, as common contributing factors of frailty. Focusing on the COVID pandemic, recent research shows that frailty, more than age or co-morbidity, is associated with in-hospital mortality and a decreased probability to be discharged from hospital [16]. In this framework, individuals declaring not having external people to share activities and resources (No Alters individuals) present relational vulnerability that makes them at risk of frailty, especially if

they live alone. Individuals that declare the presence of - at least - one not-cohabiting alter could potentially be in a condition of relational vulnerability. However, this condition may not be due to the lack of external people, but rather to dissatisfaction with the available relations, with the support received and with the perception of loneliness.

With FSS data, we can investigate relational vulnerability provided by at least two of the four basic elements we identified above: element a) and, although partially, element c), that are also related to each other. Taking into account the different hypotheses on proximity and frequency of vis-à-vis contacts with alters used to build the "easy-to-reach" and the "accustomed-to-reach" networks, we propose a criterion to identify group of subjects at a diverse degree of relational vulnerability.

We firstly distinguish between the type of network, with the idea that those who are No alters in an "easy-to-reach" network are at a critical lack of available nearby others to whom one can turn in times of need (element a). Those that are No alters in the "accustomed-to-reach" network are still considered at critical lack of available nearby alters, but they are less critical in terms of vulnerability. In fact, the conditions for alters inclusion are more strict, since the frequency of contacts is also taken into account. Seeing each others is then a clear sign of the real presence of relational ties, strong or weak they are (element b).

The analysis of the networks of relationships and the availability of relational source of support cannot disregard the individuals' stage of life course. In fact, the literature has often considered youth and elderly as vulnerable categories, needy of resilience tools to adapt and to bear difficulties or major distress events, such as the childbirth, the managing of work and care or the ageing process. Additionally, in this analysis the elderly are treated as more vulnerable than young adults because of the characteristics of the outbreak of the SARS-CoV-2. Moreover, with reference to the living arrangement, we easily recognize the presence of the partner as protective, especially for the elderly. Conversely, among couples, the partner can be considered an adequate relational resource and bring the respondents sharing this living arrangement to declare not to have any not-cohabitant people who can be a source of possible support. Therefore, individuals living in couple benefit of, at least, the relational tie with the partner.

Focusing on No Alters typology in Tables 4 and 7 and considering both the living arrangement and the stage of life course, we suggest a distinction of individuals into three level of relational vulnerability as shown in the following Table 8.

There are at least three other relevant demographic characteristics to check in order to better identify the groups of individuals at risk in case of a new emergency: gender, age and place of residence. The recent pandemic experience revealed a high value of territorial data on different scales up to the municipality level, useful firstly to monitor the evolution of cases and deaths, but also to define, manage and assess the policies introduced. The increase in mortality in Italy was then characterized by a very high degree of heterogeneity at territorial level [6]. The following set of figures (see Figure 2) shows a *mixed gender-age effect* among the category "very critical" and "more than critical" of No Alters individuals[7].

[7]In the set of figures, the percentage are referred to the subgroups of individuals divided by gender inside

Table 8: No alters individuals by degree of relational vulnerability

Living arrangement	*Stage of life course*	*Network*	*Degree*
Single	Elderly	"easy-to-reach"	Very critical
Single	Elderly	"accustomed-to-reach"	Very critical
Single	Young adults	"easy-to-reach"	Very critical
In couple	Elderly	"easy-to-reach"	More than critical
In couple	Young adults	"easy-to-reach"	More than critical
Single	Young adults	"accustomed-to-reach"	Critical
In couple	Elderly	"accustomed-to-reach"	Critical
In couple	Young adults	"accustomed-to-reach"	Critical

Among the single elderly, entering in an older age class (75+) coincides with an overturning in the incidence of those who are in a very critical situation by gender: 47% (male) versus 74% (female) and again - with "accustomed-to-reach" - 49% (male) versus 75% (female), while in the younger age class we observe a reverse relationship (53% for male versus 26% for female and again 51% versus 25%). Among the single young adults, the relational vulnerability is observed only among the older age class (25-34 ys.), with no gender differences, differently from the youngest couples (18-24 ys.), where there is a not negligible female incidence (16%). Among the elderly living in couples the situation appears up side down with respect to the elderly living alone: male (53%) in the oldest age class, more than female (35%) are classified in a critical relational situation, while the opposite is observed among the younger couples. Among elderly couples, male are on average older than female and the probability of observing female taking care of the partner is higher.

Table 9 shows the percentage of respondents living in a metropolitan area by gender and degree of relational vulnerability[8]. We highlight some particularly interesting patterns: regardless the living arrangements, the percentage of female in critical situations is constantly lower; moreover, as expected young adults are less often in critical situations; among young adults the percentages of singles are much lower than the one of couples. The metropolitan area can be interpreted as quite *protective with respect to isolation*. In fact, the percentages shown in the table are not so high (all below 21%), but this positive effect seems to be associated more to being female, single and young male.

5 Concluding remarks

The first wave – and very likely second one – of the SARS-CoV-2 pandemic is putting a strain on the social and economic organization worldwide. The implications of the interven-

each category of "very critical" and "more than critical" No Alters respondents.

[8]The complementary percentages represent respondents who are living in municipalities up to 10,000 inhabitants or beyond 10,000.

Figure 2: Very critical and more than critical individuals by gender and age class (%)

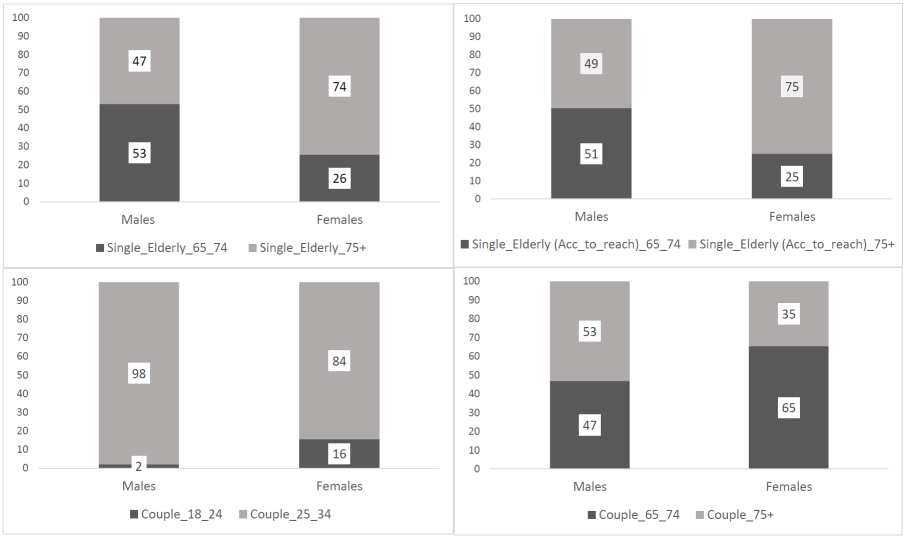


Table 9: No alters individuals living in metropolitan area by degree of relational vulnerability, network and gender (%)

		Males	Females
Very critical	Single Elderly "easy-to-reach"	20,8	11,6
	Single Elderly "accustomed-to-reach"	20,4	14,3
	Single YA "easy-to-reach"	3,2	8,3
More than critical	In couple Elderly "easy-to-reach"	18,3	15,5
	In couple YA "easy-to-reach"	14,0	13,3
Critical	Single YA "accustomed-to-reach"	2,9	13,3
	In couple Elderly "accustomed-to-reach"	19,6	16,6
	In couple YA "accustomed-to-reach"	19,3	14,6

tions adopted to contain the spread of the disease and the current uncertainty on infection exposure are profoundly changing individuals' lifestyles and behaviors, even worsening previous inequality gradients among people. In particular, the adopted large-scale lockdown as well as the announced, although lighter, local-scale social distancing measures have been determining changes both in the network of relations binding individuals to the people who are close in everyday life and in their availability of exchanging tangible and intangible resources. Results from recent survey carried out in several countries during the hardest lockdown period reported, in general, good and positive relationships inside the household environment forced to stay at home, and a rise of "virtual" relations with non-cohabiting people. On the

one hand, perceiving the household environment as very good helped people living positively and constructively the day, highlighting the importance of family ties. On the other hand, the lack of cohabitants – together with containment measures – may have worsened situations of loneliness or raised the perception of need among people living as single. Regarding relations with non-cohabiting people in the pandemic period, the physical contacts were forced to move to a "virtual ground" that can be a good way to cultivate personal relationships, as well as to share information and emotions. The lack of physical sociability (meetings and spending time together) can have compromised the instrumental support, that refers to the material resources, services and tangible help. This loss may be serious for those who were used to receiving instrumental support through a physical presence, such as young parents who often count on grandparents for the care of children or elders who need for daily care and social companionship. Couples with children have made up to the lack of instrumental support through a new organization in sharing home activities between partners, because of the wide diffusion of smart working. For elders living alone the lack of physical and immediate support can be hard to manage and to bear and this condition can be worsening by the poor ability and habit to use smartphone, tablet or personal computer for video-calls and chatting. In the last ten years the percentage of people aged 65-74 ys. using the personal computer every day has been steadily increasing up to 18,8% in 2019 and the percentage of people aged 65 ys. and more using internet every day is also increasing up to 17,4% in 2019 (I.Stat: http://dati.istat.it/). Nevertheless, if we look more specifically at the frequency of contacts through video-calls or internet with siblings, children or grandchildren, from the last FSS the elderly who never used these tools to stay in touch is always around 96%, except for male in couples where it is a bit higher (91%), while for female it is null. Similar patterns are observed among young people, except for the use of personal computer, which is slightly decreasing since the 2013 up to an average value of 43,1% in 2019 (among three age class, 18-24 ys.; 20 -24 ys. 25-34 ys.). The percentage of people aged 25-44 ys. using internet every day is instead increasing up to 89,1% in 2019 (ibidem). The most recent FSS relational data show again a quite high frequency of young people who never used internet for video-calls, especially for females living in couple, who never video-call parents (84%), while they have more often digital contacts with siblings (around 66%). The young single males are the most frequent user of technology for staying in touch with siblings (38% ca), but not with parents (23% with the father and 25% with the mother).

The strong reduction of inter-generational physical contacts observed during the lockdown among younger adults – probably due to the wish to avoid contacts of grandchildren with older people – is a new behavior to consider and monitor. From one side, this attitude can be health-protective for elderly, but from another side, it carries along the risk of leaving the elderly even more alone. The containment measures proposed in the emergency phases, that have reduced the possibility to travel, together with the suspension of health services further undermines the condition of frail individuals. From these general results we can recognize that the surveys carried out in Italy to study relational aspects during the first phases of the COVID-19 pandemic have had the merit to given several relevant and new insights on the study of the meso-level dimension in a pandemic situation. Nevertheless, the characteristics

of these surveys show at least two drawbacks that are to be considered: the sample size do not allow to describe detailed behaviors of specific groups of population, and these surveys are not included in the National Statistical Plan (NSP). The first aspect could hinder an analytical procedure for identifying and then monitoring relational vulnerable individuals. It is very likely that people living alone or in older age - often living as single or even in young couples with kids - suffered more than others the lack of physical contacts and the loss of support, especially the instrumental one, that is given or received through a physical presence. The exceptional character of these survey and lack of the acknowledgement of an official survey from the NSP do not ensure next future editions. This would hinder the comparison of an emergency with a normal situation, thus limiting their use for comparative analyses by periods and territorial areas.

This paper aimed to contribute to the existing discussion on the consequences of the containment measures by focusing on the individual relationships, which are depicted trough official data, gathered from the FSS, conducted for the first time in 1998 and repeated every five years. More specifically, using the most recent available Italian data of the FSS 2016 release, we build the ego-centered network of young adults and elderly in a pre-pandemic period, but in the light of Covid-19 containment measures. Results can be influenced by the four years lag with respect to the outbreak of the SARS-CoV-2 virus and the associated Covid-19 disease. Regarding the use of technology in social relations, the survey likely provide a not updated portray of the current situation, but at the same time the above mentioned 2019 data on the use of internet and smartphone by Italian population are not adequate to understand how people these tools to build relations. Moreover, it would be very interesting to investigate if the "virtual augmented sociability" observed during the lockdown has become a stable over time behavior or it has already weakened. In the meantime, FSS data are the only one allowing to mimic a credible relational context in the light of social distancing limitations. From the obtained results a frame to identify in advance – and eventually to protect by the adoption of effective strategies and interventions at local level – groups of individuals vulnerable with respect to social relations and exchange of resources (relational vulnerability). To figure out the networks people would count on if social distancing restrictions are at work, the "easy-to-reach" network has been defined considering only alters reachable inside the borders of the municipality of residence of the respondents, that defines a physical proximity of alters. In the "accustomed-to-reach" network a further constrain has been added with respect to the frequency of face to face contacts individuals (egoes) usually maintained with their reachable alters. The rationale behind these network assumptions is that it is more likely that the "easy to reach" network can be an ultimate resource in case of need, while the "accustom-to-reach" network represent an effective source of support in situations of reduced mobility (e.g. a new lockdown). Regardless of gender and living arrangements, the two most common "easy-to-reach" network typologies shared by young adults are either the *Non kin*, driven by the presence of friends, or the *Mixed*, with friends and/or neighbours also coupled by alters in the family. Focusing on the elderly population, most people are embedded in either a *Kin* or a *Mixed* typology, denoting the constant presence of family members in the set of alters. Some differences can be noted in group of young adults single

and in couple, with singles on average having more friends living nearby than young adults in couple. Looking at the elderly, although the average number of friends living nearby drops consistently both for females and males, slightly differences can be observed in a *Non kin* typology for single males with respect to males in couple. The magnitude of isolated individuals is over 10% in both groups of population, with the minimum value of 7.5% for the single young females and the maximum of 14.8% in the case of the single elderly males. The "accustomed-to-reach" network highlights not only the physical presence of alters, but also the habit of meetings and spending time together. In these networks, the frequency of physical contacts with siblings drop in all considered groups. Grandchildren, if present, are involved in inter-generational contacts with their grandparents, except for single males, who seem less accustomed to meet with their grandchildren. The major difference with respect to "the easy to reach" network definition is the increase in the percentage of people, of both age groups, with No alters. In particular, the percentage of elder single males, that are not only physically, but also socially isolated has been rising from 14.6% to 17.6%. The general results on the ego-centered network types of the "easy-to-reach" and the "accustomed-to-reach" networks in which young adults and elderly were embedded suggest a significant presence of "valuable" alters in all groups; nevertheless the magnitude of isolated individuals, also among the young adults, is not negligible and deserves to be carefully deepen.

The approach used for constructing personal (ego-centered) networks showed the advantage of bringing in the foreground people exposed to relational vulnerability. These are certainly identified as the No Alters individuals, because they declared in the survey not having external people to share activities and resources. Considering living arrangement, stage of life course and type of network, we then suggested a distinction of individuals into three level of relational vulnerability. The analysis of the most vulnerable No Alters individuals by age, gender and place of residence revealed that to be single is often associate with a condition of relational vulnerability not only among elder people, but also for young adults, especially if aged between 25 and 34 ys. The results highlighted then the role of context of residence, even if this was empirically measurable only through three broad categories, not adequate to catch the more proximate space of living and interacting of individuals. The protective effect with respect to isolation of metropolitan areas could be explained by the scarce statistical representativeness of the sample data, calling for more adequate information to evaluate the role played by residential context in the relational vulnerability. The focus on No Alters individuals has been proposed also with the aim to provide operative suggestions for adding information on relational context in which the individuals are embedded, when local public administrations project actions to monitor and face at risk situations. This should bring consequently a more widespread data collection awareness with regard to personal networks.

The upcoming data collected by SHARE and by the next release of the FSS will allow to investigate effective changes in social relations of Italian individuals.

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Figures

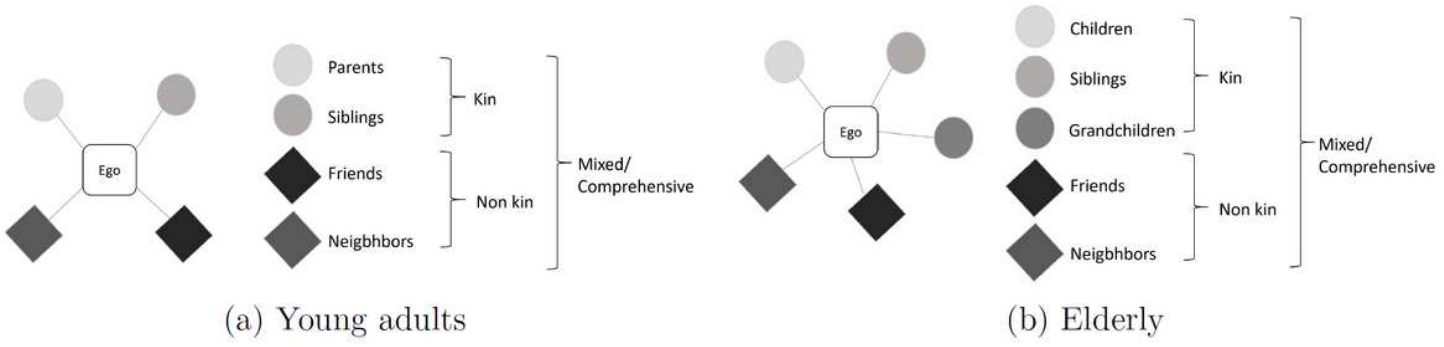

Figure 1

"Easy-to-reach" network by alters role

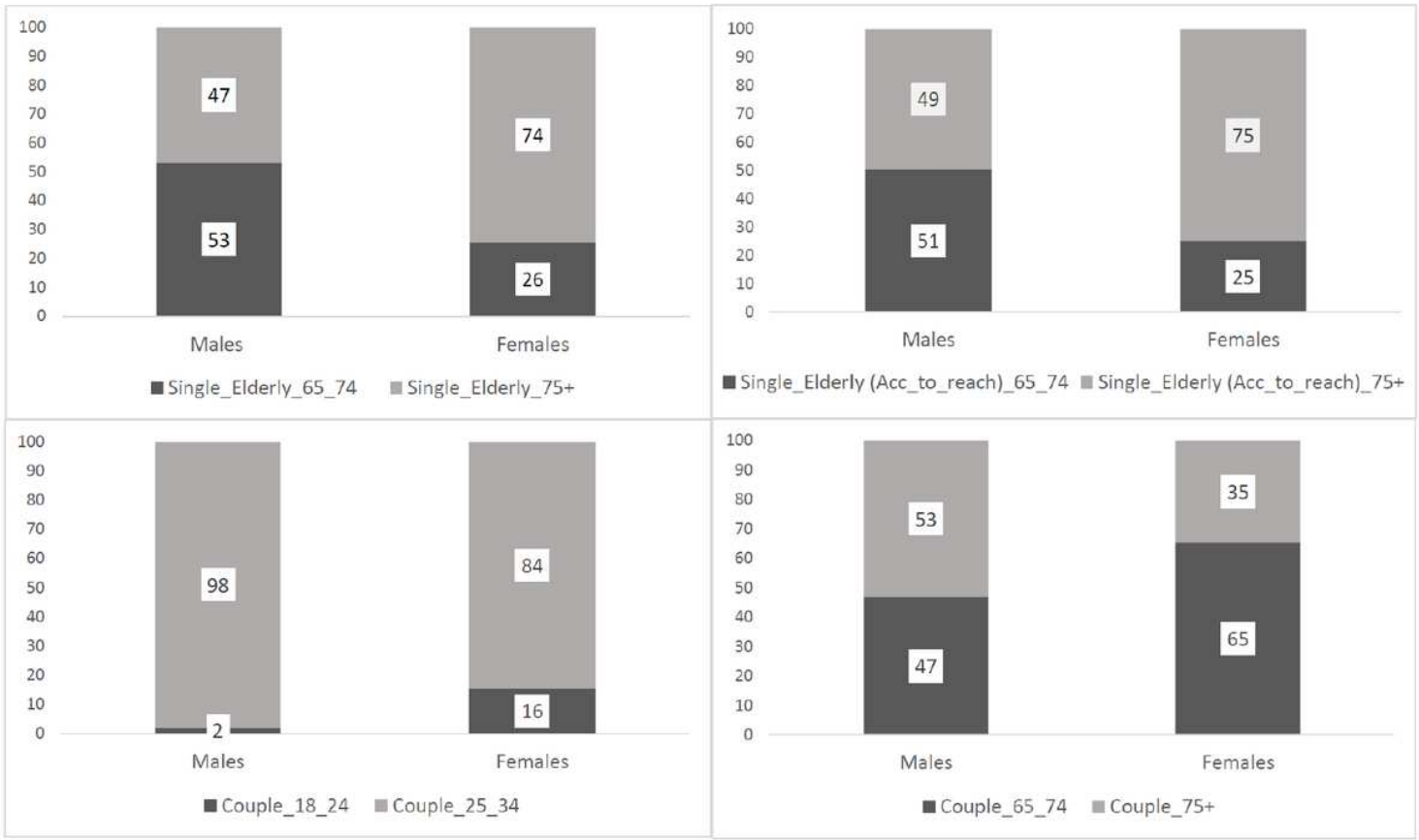

Figure 2

Very critical and more than critical individuals by gender and age class (%)