

# Spatial requirements and standards in the post-COVID-19 house

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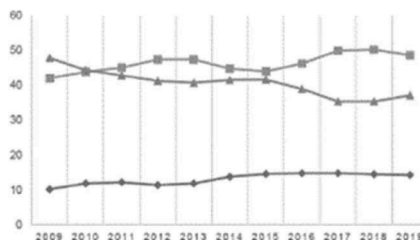
**ABSTRACT:** In people’s imagination, the dwelling represents a fundamental part of life. However, the COVID-19 pandemic has radically changed people’s usual way of living, working, entertaining, and leading life. The situation has imposed a radical rethinking of the constructed environment. In fact, problems connected to the quality of buildings, not only energetic, have emerged and those related to the general well-being, with particular attention to the space where everyday life takes place and the requirement of external spaces such as balconies or terraces, has emerged. This chapter covers an aspect of well-being related to the quality of space in the dwelling and its characteristics as a place for living. The case study regards the economic and popular buildings located in the city of Bari. The case study highlights contrasting living conditions, which impose a generalized review of the dwelling.

**Keywords:** Living space, Covid-19 housing, Space standard, Crowding index

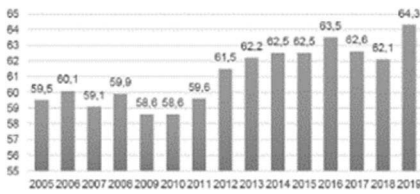
## 1 COMPOSITION OF THE ITALIAN POPULATION

With its population and society, the contemporary city can be assimilated to a constantly evolving organism, subject to continuous changes due to the economic, social, and space-time conditions of the places where its inhabitants reside. The undisputed protagonist of society is the family: habitual and privileged residents of our cities. Giuseppina Sacco [Sacco, 2020] stated that the term family presumes a group of people who live together, forming, transforming, and dividing itself, giving birth to a familiar structure. From this, other familiar relationships derive, which are established between initially distinct groups. However, currently, the “traditional” family model, based on the spouses and the centrality of the children, has radically changed. The establishment of different socio-economic and cultural conditions has substantially revolutionized the composition of the households, both in terms of composition and number. The study by Chiara Lodi Rizzini [Lodi Rizzini, 2013] highlights how a significant role in the changing process has originated from the working condition of women as well as the subsequent decrease in the “total fertility rate”; the increase of education, which has led to a prolonged permanence of the children within the household; the decrease of weddings, with a significant increase of singles, separations, and divorces. The data from ISTAT [ISTAT, 2016] reinforces these concepts and highlights how, after an apparent increase of the population and families, its size has changed, moving from

an average of 3.35 components per family to 2.4 components per family just 40 years (1971-2011). This analysis is moreover reinforced by the fact that, for the same period, it is observed that families of 5 or more components have shifted from 21.25% of the population to 5.72%. Vice versa, there is a significant increase in the percentage of the single-person households, which, if in 1971 accounted for merely 12.90% of the families, in 2011 correspond to 31.15%. However, the decrease in the number of components within the households is not the only element observed. Instead, the number of single-parent families – composed of a single parent with children – has increased (this factor is boosted by the increase in the separations and divorces), the number of self-sufficient elderly over-65 who still live alone. Lastly, the condition of the youths between 18 and 34 who still live in the family is another strong influence.



Graphic 1. Marital status of single parents 2009-2019 (Source: ISTAT - Aspects of daily life Households).



Graphic 2. Young people aged 18-34 living in a household with at least one parent, 2005-2019 (percentage values of samples with the same characteristics) (Source: ISTAT, Aspects of daily life - Households).

The emerging extremely varied pattern of types of families generates requirements related to the definition of new environments connected to the living needs: the estate assets currently available, especially the public ones, should find a new inclusive scale that can meet different requirements [Lodi Rizzi, 2013].

## 2 THE EMERGENT SOCIAL HOUSEHOLD

The presence of different and new kinds of households inevitably steers the debate towards the revision and the research of living standards that are more responsive to the new reality. In fact, it is undoubted that the varied households present different needs and requirements. Therefore, a first classification should start from defining the components of the “new family,” making a distinction based on the working condition, the marital state, age, the presence (or absence) of cohabiting children and/or elderly. In the study of the domestic space of Portuguese housing, conducted in 2015 by Rute Gomes et al. [Gomes, 2015], the necessity to make such distinction emerges since different requirements and living spaces correspond to each household. The distinction made based on such census sees, therefore:

- the single-person households based on age and occupation: single-person households within working age (25-64 years of age), single-person households in non-working age (over 65 years of age);
- households composed of two people, which also include less traditional types of families: couple without children; a single parent with a child; unrelated cohabitants, households of three people;
- households of three people: a couple with a child, single parent with two children (same or different sex), unrelated cohabitants, families composed of several households (e.g., a couple with an elderly cohabitant);
- households of four people: a couple with two children (same or different sex), single parent

- with three children, unrelated cohabitants, families composed of several households (e.g., a couple with a child and an elderly cohabitant);
- households of five or more users, including numerous combinations such as parents with three children, parents with children and elderly cohabitants, couples of parents with children and a child with their newly composed family, etc.

## 3 TIMES AND WAYS OF LIVING OF THE URBAN SOCIETY PRE AND POST COVID-19 PANDEMIC

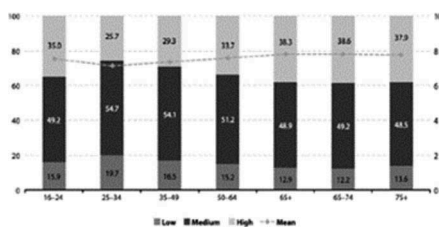
Each individual’s time spent within their home was mainly related to personal care activities, domestic chores, and rest. Instead, the remaining part of the day was spent outside, namely for free time, work, education, and training with the consequent commute to reach the places predisposed for those activities. As it can be observed, the working single-person households (between 25 and 64 years of age) spend most time outside their home (45% over 24 hours), followed by the single-parent families with children (34% over 24 hours). The lowest percentage of time spent outside the home is represented by the unemployed between 45 and 64 years of age, with 29%. Therefore, the home was gauged, conceived, and organized over the years to accommodate a limited number of activities normally included in its residents’ lives. Therefore, the housing surface could not correspond to the family’s actual requirements since some of its members could perform some of the functions, as study and work, also outside.

The impact of the health emergency caused by the COVID-19 pandemic has imposed periods of lockdown alternated to semi-lockdown on the entire national territory. Such circumstance has made it necessary to relocate all the activities usually performed outside the home. In fact, on an average of around 60% of permanence at home, in 2014, it became necessary to remain home 100% of the 24 hours during the pandemic. [ISTAT, 2017] This has occurred in all social categories, regardless of age, family condition, or occupation. Therefore, the home has been adapted to the requirements of the moment, making room for work, education, and free time. However, is the Italian housing, with its characteristics and sizes, able to satisfy these new requirements? The investigation of the Italian Revenue Agency [Agenzia delle entrate, 2019 e 2020] for the years 2019 and 2020 reports that more than a third of the housing has a surface between 50 and 85 sqm, but at the same time, according to the latest census, [ISTAT, 2017] more than a third of the

population lives in apartments under 60 sqm. The same data reveals that 20.7% of the apartments in this range have a surface of 80 sqm with four or more people living inside. It is then clear that this pandemic situation has significantly highlighted the condition of household crowding, a circumstance that until before the pandemic (as mentioned previously) was compensated by the time the individuals spent outside the home. The greatest criticisms have emerged in all those realities where privacy and space were lacking; in other words, all those households composed of more than two people, especially those with more than a child in school age.

#### 4 DWELLING SATISFACTION AND HOUSEHOLD CROWDING INDEX

Multiple aspects describe the living conditions of the families ranging from the problems of the building organism in its stability and energy consumption to the quality of the living space of the dwelling. Since 2013, through the BES within the indicator “economic well-being,” the ISTAT identifies the condition of “severe living deprivation,” pointing out, among the fundamental factors of household crowding, structural problems, lack of adequate and sufficient restrooms and services, [M.D, 1975] and last, the inadequate illumination of the areas. In the section “Living conditions in Europe,” the investigation conducted by Eurostat [Eurostat, 2014] remarks and reinforces these problems underlining how the household composition significantly influences the household crowding index. This investigation reveals that the highest dissatisfaction is expressed by those who live in single-parent families, with 16.0%, followed by families with two adults and three or more children (13.1%). Interestingly, the degree of dissatisfaction with the home is higher in households with children aged between 25 and 34 years of age.



Graphic 3. Degree of satisfaction with housing by age group, EU-28, 2013 (Source: Eurostat, Quality of life. Facts and views, 2015).

The household crowding index is the parameter that measures the quality of the living conditions and the availability of sufficient space in a dwelling in relation to the size of the household and the age of its members. As a result, it is a highly variable parameter in the life of a household. In particular, as reported in the Eurostat investigation [EUROSTAT, 2015], a dwelling is considered crowded if the household does not have at its disposal a minimum number of rooms:

- one room for the household;
- one room per couple in the family;
- one room for every single person aged 18 or more;
- one room per pair of same-sex children between 12 and 17 years of age;
- one room for every single person aged 12 to 17 years of age not included in the previous categories;
- one room per pair of children under 12 years of age.

Therefore, the formula to calculate the household crowding index is:

$$\text{Household crowding index} = \frac{\text{number of users}}{\text{number of main rooms of the dwelling}}$$

It is fundamental to point out that the main rooms are all the dwelling rooms, excluding the services and halls. Suppose the resulting value is smaller than one (household crowding index < 1), the dwelling is classified as oversized compared to the users’ requirement. On the contrary, the dwelling is considered overcrowded when the number of rooms available is insufficient to satisfy the minimum space requirement previously defined (household crowding index > 1). The observation of the European data indicates that in 2016 around 16.6% of the families lived in overcrowded dwellings. Moreover, such ratio was higher in east Europe, slightly lower in the southern countries, and considerably lower for the north of Europe [EUROSTAT, 2015].

This situation is undoubtedly due to the different living policies in the various countries and cultural habits, which tend to respond to the lack of welfare with the permanence of the youths (between 25 and 34 years of age) within the household of origin. The crowding condition is undoubtedly more evident for those living in cities (17.6% of the population) than households in the rural areas or the outskirts (14.9%). However, the crowding parameter is not sufficient to indicate the inadequateness of the dwelling. Such parameter is generally associated with the average number of rooms per person. Also, in this case, there are two relevant matters: the number of rooms per person is lower for people living in the cities (1.5) compared to those living in the rural areas (1.7); a low average per user is confirmed for

the eastern European countries, slightly higher for the southern ones and high for the northern ones (in Belgium it reaches up to 2.2 rooms per user). The limit of this investigation lies in the fact that the data are collated by country and rarely report values for less extended geographical areas. If we focus the attention on the case of Italy, there are collated data for the main Italian cities, in which the urban and the suburban data are assimilated, resulting in compromised final data. In fact, the average number of rooms per user in the cities appears to be noticeably reduced by the average of the suburban and rural areas.

## 5 RELATIONSHIP BETWEEN THE REQUIREMENTS AND COMPOSITION OF THE HOUSEHOLD: AN ITALIAN INVESTIGATION

The World Health Organisation has fought for human rights many times, reporting among the fundamental rights the necessity of an adequate dwelling to one's existence. In particular, in October 2010, on the occasion of the International Workshop on housing, health, and climate change, it has remarked that, among the indicators which define the quality of the dwelling, there is undoubtedly also an adequate living space to guarantee the privacy and allow everyday activities. Starting from this consideration, the case of a household composed of 4 users has been analyzed and formed by the same number of components but variously articulated. The requirements defined for each group has been given starting from the dispositions of the health and hygiene norms [M.D, 1975]. From this assumption, we proceeded to make a comparison between the housing conceived and designed according to the "traditional family" model, which sees for the children a prevalently double number of bedrooms regardless of sex and age and a dwelling with the same number of components but different compositions and associating to each child the bedroom in relation to the age and sex as indicated by the household crowding index. It is important to remember that such analysis is based on a dwelling of economic and popular construction, which therefore has to respond to norms relating the number of users to the surface of the dwelling (as per norm reference).

## 6 THE DEFINITION OF THE SURFACES AND THE RELATIONSHIPS BETWEEN THE AREAS OF THE DWELLING

The parameter used for the definition and the quantification of the spaces is related to the number of rooms required for the sleeping area. This value,

defined by the D.M.—for the single and double rooms, does not distinguish between the occupants' parental relationship, age, and sex. The space of the sanitary facilities has been associated with this computation, calculated as one only for the households composed by one or two people, and two for the more numerous households (one with a bigger size with a bathtub, and a smaller one with a shower). Then, the values of the distributor surfaces have been entered. These do not have a defined surface by the norm but are widely codified by the existing manuals. Therefore, we have referred to those values reported in the Neufert [Neufert, 1999]. The surface of the living area, composed of the living room, dining room, and kitchen with the related distributors, has been obtained as a difference of the general surface, minus the sum of the sleeping area (composed of the bedroom, sanitary facilities, and related distributors). It has emerged that the definition of the spaces necessary to the single person households disregards the age of the individuals it refers to, it being a double bedroom and a single service. The problems start to appear with the households with two people. In this circumstance, there are different requirements for the bedrooms where the users are not a couple, while it can be supposed that the number of sanitary facilities remains unchanged. The households composed of 3 people present a multifaceted framework of requirements, especially with the fact that the necessities connected to the rooms of the sleeping area have to consider the age and the sex of the children. In this case, moreover, the presence of a second bathroom starts to become important for a better liveability of the dwelling. However, the presence of the second sanitary service is not always required; sometimes, for the compositions of particular households, it could be removed in favor of a laundry room or a closet. It is nevertheless a space to take into account in the assessment of the surfaces. In households composed of 4 people, the frame of requirements becomes complex and differentiates further. In particular, for the attribution of the bedrooms in the single-parent household with three children, it is supposed that only one of the children has a single room, while the other two share a double room. However, if we only consider the normative data for a dwelling for four people, it does not pay attention to the household composition since it presupposes that there are only two bedrooms (one double and one twin). It goes without saying that normally, for this kind of dwelling, to compress the spaces and give more surface to the living area, the tendency will be to have two double bedrooms. The following table illustrates the situation showing the complexity of the households and the related spaces.

NUCLEI CON 4 PERSONE					
Tipologia di stanza	Camera matrimoniale	Camera singola	Camera doppia	Bagno principale	Secondo bagno
Coppia con 2 figli dello stesso sesso					
Entrambi i figli di età inferiore ai 17 anni	1		1	1	1
Entrambi i figli maggiorenni	1	2		1	1
Coppia con 2 figli di sesso diverso					
Entrambi i figli di età inferiore ai 12 anni	1		1	1	1
Entrambi i figli di età superiore ai 12 anni	1	2		1	1
Monogenitore con 3 figli (primogenito + 2 figli dello stesso sesso)					
Entrambi i figli di età inferiore ai 17 anni	1	1	1	1	1
Entrambi i figli maggiorenni	1	3		1	1

Figure 1. Framework for groups of 4 people.

It is evident how the number of spaces inside the dwelling change even if we refer to households composed of the same number of individuals but different family compositions.

## 7 CHARACTERIZATION OF THE DWELLING STARTING FROM THE SURFACES OF NORMATIVE REFERENCE

At this point, it was necessary to define the surfaces of reference for the entire dwelling concerning the number of users. The case study (EEP building located in the city of Bari) has led to choose as normative references the Regional Law of 7 April 2014, n. 10, which establishes the relationship between users and surface (45 sqm for 1 or 2 people; 55 sqm for three people; 70 sqm for four people; 85 sqm for five people; 95 sqm for six people).

Next, we proceeded to the definition and the attribution of the surfaces as illustrated in the previous paragraph and reference to the RE of Bari City Council of 2012. The following surfaces have been attributed: 9 sqm for the single bedroom, 14 sqm for the twin or double bedroom, 3.5 sqm for the bathroom with a bathtub (minimum size), 2.0 sqm for the sanitary facilities with a shower (minimum size). Lastly, since the size of the distributors cannot be rigidly standardized, given that their size depends on the distribution of the rooms in the dwelling, the surface reference reported on the design manuals has been used [Neufert, 1999], for which the minimum surface is calculated in function of the number of rooms overlooking it.

The major problem was the sizing of the living area, for which there are normative indications only for the living room (16 sqm for the national normative and 14 sqm for the RE of Bari City Council) at

national scale and for the kitchen (9 sqm) at the municipal scale. Therefore, the living area, including the living room, dining room, kitchen, hall, and annexed distributors, has been supposed to be computable as a difference between the rooms of the sleeping area, the sanitary facilities, and the annexed distributors. The case study report is based on a household of 4 users for a total surface of a minimum 70.00 sqm dwelling. For each macro category of household, differentiated by the number of components, the sleeping areas have been defined in the first place: the number and kind of necessary bedrooms, the number of sanitary facilities, and distributors have been associated. Consequently, the surface of the living area has been attributed as a residual surface, as already illustrated in the previous paragraph. On average, we can attribute the following surfaces to a dwelling conceived for a “traditional household.”

Zona Notte	Camera matrimoniale	14,00 mq
	Camera doppia	14,00 mq
Zona Giorno	Cucina-Pranzo-Soggiorno	30,50 mq
Servizi	Bagno	5,50mq
	Secondo bagno	2,00 mq
	Distributori	4,00 mq
SUPERFICIE TOTALE		70,00mq

Figure 2. Areas of accommodation for four persons by functional areas.

For the households composed of 4 users but variously articulated, we have referred to the aggregations and surfaces reported on Graphic 4.

The high number of components of the household, which cannot always be grouped among themselves by age and sex, implies numerous criticalities connected to crowding, which are more evident in the case of a single parent with three children of different sex and age.

In particular, analyzing this type of household, it is evident that it is necessary to have a sleeping area composed of a double room and three single rooms for 41 sqm. Starting from the surface of reference, corresponding to 70 sqm, it is evident how the sleeping area occupies more than 50% of the total surface at the expense of the living area. Therefore, the necessity of further bedrooms, but the impossibility of their realization, cause a critical situation of living discomfort related to the lack of privacy and the inadequacy of the common spaces.

Therefore, since the normative value fixes the dwelling general surface and rooms in the sleeping area, there is substantial difficulty in guaranteeing the right levels of privacy with the allocation of private spaces.

8 POSSIBLE SCALE SCENARIOS

The criticalities highlighted in the previous paragraph lead to a remodulation of the relationships in the dwelling and the related surfaces. Differently from the condition illustrated in the previous paragraph, we started by attributing an established value to the living area (resulting from the previous computation). This value represents undoubtedly a limit in the total assessment of the surfaces, but it is a first step of an investigation still in progress. The computation methodology is based on the reference of the living area surface calculated for the “traditional family” (couple with two children), 30.50 sqm.

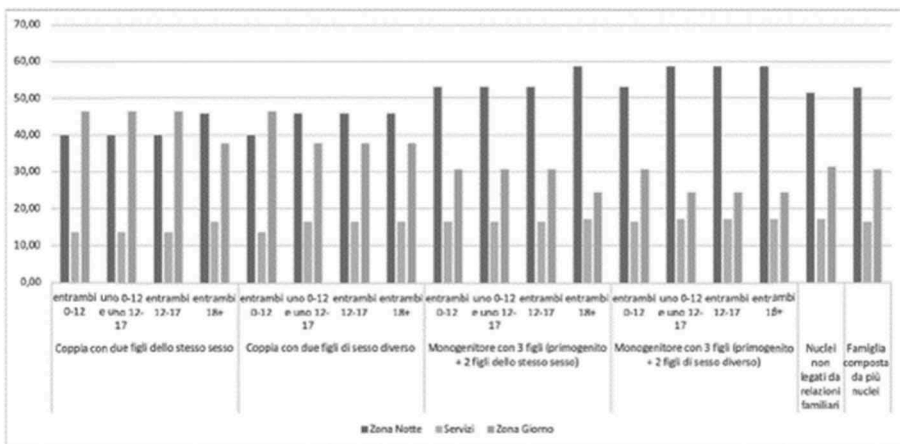
Depending on the various households’ aggregation type, the bedrooms surfaces, sanitary facilities, and distributors have been added. The following table illustrates the surface in its new possible configuration for each household.

In graphic 7, there are noticeable differences of surfaces for the various possible aggregations of people depending on the household composition.

Considering the situation, it is obvious that the demand for privacy and an adequate living space conflict with multiple factors caused mainly by the sanitary and hygiene regulation, which, although effective in the years it was imposed, is currently rigid and inflexible.

		Sup. di riferimento	Camera			Bagno principale +	Distributori	K-P-S
		(L.R. 10-2014)	matrimoniale (mq)	singola (mq)	doppia (mq)	secondo bagno (mq)	(mq)	(mq)
Coppia con due figli dello stesso sesso	entrambi 0-12	70	14		14	5,5	4	32,5
	uno 0-12 e uno 12-17	70	14		14	5,5	4	32,5
	entrambi 12-17	70	14		14	5,5	4	32,5
Coppia con due figli di sesso diverso	entrambi 18+	70	14	9 x 2		5,5	6	26,5
	entrambi 0-12	70	14		14	5,5	4	32,5
	uno 0-12 e uno 12-17	70	14	9 x 2		5,5	6	26,5
Monogenitore con 3 figli (primogenito + 2 figli dello stesso sesso)	entrambi 12-17	70	14	9 x 2		5,5	6	26,5
	entrambi 18+	70	14	9 x 2		5,5	6	26,5
	entrambi 0-12	70	14	9	14	5,5	6	21,5
Monogenitore con 3 figli (primogenito + 2 figli di sesso diverso)	uno 0-12 e uno 12-17	70	14	9	14	5,5	6	21,5
	entrambi 12-17	70	14	9	14	5,5	6	21,5
	entrambi 18+	70	14	9 x 3		5,5	6,5	17
Nuclei non legati da relazioni familiari Famiglia composta da più nuclei	entrambi 0-12	70	14	9	14	5,5	6	21,5
	uno 0-12 e uno 12-17	70	14	9 x 3		5,5	6,5	17
	entrambi 12-17	70	14	9 x 3		5,5	6,5	17
		70		9 x 4		5,5	6,5	22
		70	14 x 2	9		5,5	6	21,5

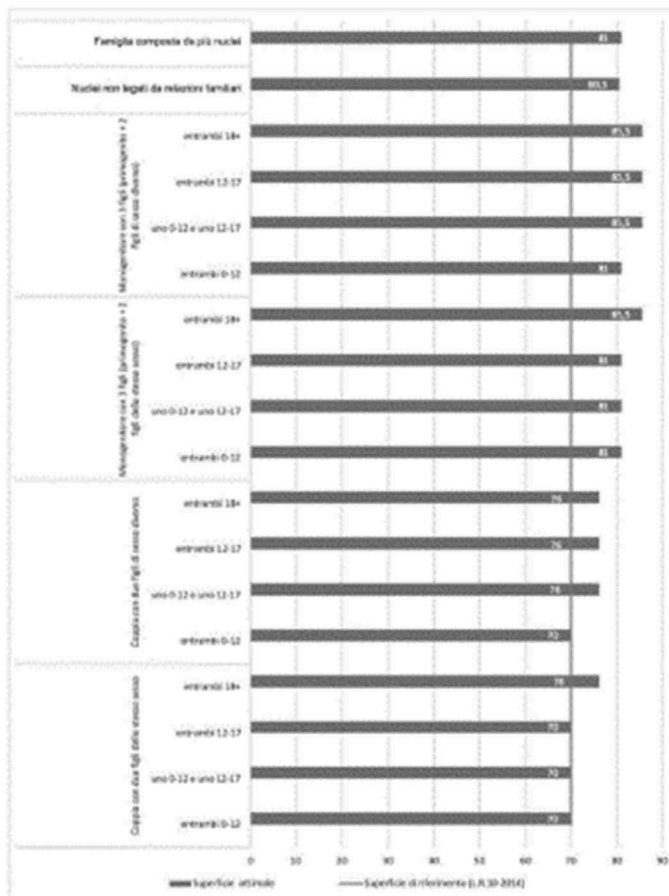
Graphic 4. Calculation of reference areas for each family grouping.



Graphic 5. Percentage weight of functional zones per housing of 4 users per family grouping.

		Sup. di riferimento (L.R. 10/2014)	Camera matrimoniale (mq)	Camera singola (mq)	Camera doppia (mq)	Bagno principale + secondo bagno (mq)	Distributori (mq)	K-P-S (mq)	Superficie stimata
Coppia con due figli dello stesso sesso	entrambi 0-12	70	14		14	5,5	4	32,5	70
	uno 0-12 e uno 12-17	70	14		14	5,5	4	32,5	70
	entrambi 18+	70	14		14	5,5	4	32,5	70
	entrambi 18+	70	14	9 x 2		5,5	6	32,5	76
Coppia con due figli di sesso diverso	entrambi 0-12	70	14		14	5,5	4	32,5	70
	uno 0-12 e uno 12-17	70	14	9 x 2		5,5	6	32,5	76
	entrambi 12-17	70	14	9 x 2		5,5	6	32,5	76
	entrambi 18+	70	14	9 x 2		5,5	6	32,5	76
Monogenitore con 3 figli (primogenito + 2 figli dello stesso sesso)	entrambi 0-12	70	14	9	14	5,5	6	32,5	81
	uno 0-12 e uno 12-17	70	14	9	14	5,5	6	32,5	81
	entrambi 12-17	70	14	9	14	5,5	6	32,5	81
	entrambi 18+	70	14	9 x 3		5,5	6,5	32,5	85,5
Monogenitore con 3 figli (primogenito + 2 figli di sesso diverso)	entrambi 0-12	70	14	9	14	5,5	6	32,5	81
	uno 0-12 e uno 12-17	70	14	9 x 3		5,5	6,5	32,5	85,5
	entrambi 12-17	70	14	9 x 3		5,5	6,5	32,5	85,5
	entrambi 18+	70	14	9 x 3		5,5	6,5	32,5	85,5
Nuclei non legati da relazioni familiari Famiglia composta da più nuclei	entrambi 0-12	70		9 x 4		5,5	6,5	32,5	80,5
	Famiglia composta da più nuclei	70	14 x 2	9		5,5	6	32,5	81

Graphic 6. Calculation of optimal housing areas for each household category.



Graphic 7. Ratio between the reference surface area established by legislation and the optimal surface area calculated for each type of household with four components.

## 9 CONCLUSION

The research, of which only some aspects of the living condition have been highlighted, shows how the current economic and social housing still presents numerous defects both from the technical point of view, particularly related to the obsolescence of most structures and technology. The most referenced aspect was the failure to meet the new needs of privacy and well-being. In order to solve these issues, one of the main aspects to focus on is the attribution of the dwellings, which has not been covered in this paper but is fundamental for a correct policy of revision of the whole system. Oftentimes, the Institution allows the allocators of dwellings to transfer their own right to allocate from one generation to the next. This circumstance blocks a real allocation of the dwelling in function to the requirements of the family that will occupy it. Undoubtedly, since the D.M of reference of the living standards, 45 years have gone by, and society's situation has noticeably changed.

Moreover, by attributing rigid spatial and scale relations to the surfaces, the D.M. has blocked the planning decisions. On top of this situation, the dwelling design and rationalization, which stem from the experimental research of the post-war period defined by the volumes "ina Casa," were also dedicated to consolidated and constant households. The event of the COVID-19 pandemic has strongly remarked the importance of the living conditions highlighting the vast living inequalities, particularly in the metropolitan areas. Therefore, this imposes the necessity to provide updated requirements for the constructed environment, particularly for public and social housing.

## ACKNOWLEDGMENTS

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