

Semi-basements used as dwellings: hygienic considerations and analysis of the regulations

L. Capasso*, A. Basti**, A. Savino***, M.E. Flacco*, L. Manzoli*,
D. D'Alessandro****

Key words: Building hygiene, living conditions, hygienic requirements, semi-basements
Parole Chiave: Igiene edilizia, seminterrati, normative

Abstract

Current housing shortage in Italy is forcing a growing number of individuals to use as living environment spaces that were originally devoted to other purposes. Among such spaces, semi-basements hold a particular relevance because of their specific characteristics and their effects on human health. The authors analyse the relatively scarce legislation about this topic at both national and regional level. The local Building Codes of the ten most populous cities of Italy are reviewed, assessing whether the use of semi-basements as living spaces is allowed and, if so, which restrictions and requirements are imposed. The authors conclude that, on one hand, further research is strongly needed to estimate the amount of exposed population and their health risk, on the other the existing legislation on the topic is often discretionary and deeply unhomogeneous across the country.

Introduction

Hygienists have known the unhealthiness of basements and semi-basements since the 19th century (1). As a matter of fact, such areas are usually wet for the accumulation of moisture of diverse provenience (i.e. rising damp, seepage or condensation), and have scarce illumination and/or natural ventilation, both of which are key aspects to assure adequate drying and removal of dangerous airborne contaminants such as cigarette smoke and radon (2, 3, 4). The above mentioned phenomena have increased in the last few years due to climate modifications.

The consequences of living in an unhealthy space are multiple and related

to relevant social and sanitary costs: microclimate modifications induced by damp and deficiency of appropriate heating systems are risk factors in the development of acute and chronic illnesses such as allergic rhinitis, asthma, eczema, respiratory infections (5, 6, 7, 8), and chronic disabilities in adulthood (9). Exposure to radon, a radioactive noble gas, carcinogenic if inhaled (Group I according to IARC classification) (10) and second cause of lung cancer (11), is higher in semi-basements. An inappropriate living context can though significantly affect physical and psychic health of exposed population, as well as social aspects (12, 13, 14).

Italy has been passing through a phase of dwelling crisis, peculiarly in greater

* Department of Medicine and Aging Sciences, "G. d'Annunzio" University, Chieti, Italy

** Department of Architecture, "G. d'Annunzio" University, Chieti, Italy

*** Service of Hygiene, Epidemiology and Public Health, ASL Lanciano-Vasto-Chieti, Italy

**** Department of Civil, Environmental and Architectural Engineering, Sapienza University of Rome, Italy

urban areas (15). This led to a progressive increase in residential use of spaces not usually considered as living environments, such as semi-basements (16, 17, 18) and under roof spaces. This has been observed as a common phenomenon, noticeable in other countries as well (13, 19, 20, 21). Moreover, discretion due to scarce or conflicting regulations fuels a conflict among territorial hygienists' consciences.

Our study aims to review and compare currently available regulatory instruments on semi-basements for public health operators and building designers, with a particular focus on the criteria on which these instruments rely.

Materials and methods

Our study examined national, regional and local regulations specifically referring to the use of semi-basements as living spaces.

Sources search has been carried out until February 28th 2013 on both mainstream (Google) and legal-based (DeJure-Giuffré e Maxima-Praxis) search engines.

Shortage of results in existing national legislation on building hygiene (22, 23), sometimes in contradiction with regional and local codes, has made necessary the analysis of the latter as well. Being this a preliminary study, our attention has focused on cities that could be relevant samples of the national panorama: therefore, the ten largest Italian cities by population size have been chosen (24): Rome (25), Milan (26), Naples (27), Turin (28), Palermo (29), Genoa (30), Bologna (31), Florence (32), Bari (33) and Catania (34).

The selection of these cities, that represent overall 15% of the nation's total population, has been based on the following hypothesis:

- main housing shortage is noticed in most populated areas;
- probability of semi-basement use as living environment may be higher;
- is therefore more likely that local Building Codes set rules on semi-basement use.

Considering the extent and the discrepancies of regional normative production, as well as its continuous evolution, our research might result not completely exhaustive. The regions cited in the study have actually legislated about the use of semi-basement as living environments. At a local level, we decided to focus on Building Codes for the following reasons: they are practical tools for public health operators and architects when they need to decide in regard to the usage of semi-basement; on average, they are more updated than Local Hygiene Codes (35); they are more relevant, being semi-basement requirements of their specific competence.

Results of legislative review have been tabled, to ease comparison of significant health and hygiene aspects.

Results of review and discussion

National legislation about building hygiene (22, 23) sounds inadequate. The only national normative reference on semi-basement usage dates back to 1896, and are the Ministerial Instructions for the draft of Local Hygiene Codes (*Compilazione dei regolamenti locali di Igiene del suolo e dell'abitato*) (36). This law at article 58 states that *no room of which walls are, in whole or in part of their height, located underground will be used for permanent habitation by one or more persons*. The same law at the further article declares that an exception can be made only if the walls height is at least 3 m, of which at least 1 m above ground,

that they must be at least 1,5 m away from the street and 2 m away from underground aquifer; and that there must be sufficient illumination and ventilation. It is very interesting that these two articles are the first two of the section 5 “*Living Spaces*” underlining that semi-basements can not be habitable.

As a second step, we analyzed regional laws and evidenced that many regions authorize the use of semi-basement for tertiary and commercial purposes, also if that actual Italian labor legislation, article 68 of D.lgs. 81/2008 (37), does not allow it, unlike what Ministerial Instructions of 1896 affirms at article 60 (36). Some regions permit to use them also as habitations, sometimes imposing additional requirements (Table 1), always less restrictive than the ones imposed by the Ministerial Instructions. For example, Sardinia Region states that the wall are to be 2,4 m high, of which at least 1,5 above ground and that windows\ floor ratio is not to be less than 1/8 (38). Sicily Region imposes only a height requirement of 2,4 m (39). Umbria Region poses less restrictive requirements, but allows Local Health Authorities to decide about hygienic appropriateness (40, 41). The other regions have more restrictive requirements (42, 43).

The analysis of the Municipal Building Codes of the ten largest Italian cities provided a picture of predictable inequalities among the different parts of the country. In particular, only two Codes (Rome and Florence) allow the use of semi-basements as living spaces (25, 32). The situation in Palermo remains unclear, as the Code, at the article 56, mentions only the new-built dwellings (29); same happens in Genoa too, where the Code forbids the habitable use of semi-basements only in the old town center (30). The Building Code of Catania, at article 146.3, does not allow using this

places as living spaces (34), but at the meantime at article 19, it refers to the Regional law number 4 of 16/04/2003 (39) that allows their use only in case of building restoration. The Building code of Rome, at article 38, allows to use semi-basements as dwellings, but it imposes some requirements. In particular, the ceiling highness is to be at least 3 m, at least half of the walls are to be above the ground, there will be a ventilated cavity of 0,5 m around the walls and another of at least 0,3 m under the floor. The same article imposes a windows\floor ratio of no less than 1/8 and minimum width of the street of 10 m (25). The Building Code of Florence, at article 134/bis, allows the usage of semi-basements as habitations only if, in addition to all normal requirements, there is a ventilated cavity around and below the structures that divides the house from the ground (32).

In the end, we can therefore notice that in the largest part of municipalities we analyzed, the Building Codes respect what is sentenced in the Ministerial Instructions of 1896 about habitable usage of semi-basements. The exceptions consider anyway some means to provide an healthy environment (Table 1), also if they impose less restrictive requirements.

Conclusions

The present study represents a first step in dealing with the problem of semi-basements use as living environments, and aims at constituting a base for further in-depth scientific analysis, with the purpose of supporting public health operators' and designers' practical activities.

The previously evidenced study complexities are necessarily considered as limits, but they allow as well some relevant reflections, for example on the

Table 1 – Semi-basements used as dwellings and their requirements

	Use of semi-basements as living spaces is specifically stated	Minimum Height	Wall above the ground	Cavity Size	Windows/ floor ratio	Other requirements
Ministerial Instructions (29)	Yes*	3 m	1/3	1,5 m	1/8	Distance from the underground aquifer
Regional Laws						
Umbria (33, 34)	Yes	NS	1/4	NS	1/16	Appropriate solutions for insulation and ventilation
Sardinia (31)	Yes	2.4 m	1,5 m	NS	1/8	Not required
Puglia (36)	Yes	2.7 m	NS	NS	1/8	Mechanical ventilation systems may be installed to ensure a sufficient air change when the natural one is inadequate
Calabria (35)	Yes	2.7 m	NS	NS	NS	Respect of the requirements stated in D.M. Sanità 05/07/1975 (17)
Sicily (32)	Yes	2.4 m	NS	NS	NS	Non required
Municipal Building Codes						
Rome (19)	Yes	3 m	1/2	0.5 m side 0.3 m below	1/8	The street in front of the window must be at least 10 m wide
Milan (20)	No	NA	NA	NA	NA	NA
Naples (21)	No	NA	NA	NA	NA	NA
Turin (22)	No	NA	NA	NA	NA	NA
Palermo (23)	No**	NS	NS	NS	NS	Not required
Genoa (24)	No***	NS	NS	NS	NS	Not required
Bologna (25)	No	NA	NA	NA	NA	NA
Florence (26)	Yes	NS	NS	0.6 m	1/8	Ventilated cavity below
Bari (27)	No	NA	NA	NA	NA	NA
Catania (28)	No****	NA	NA	NA	NA	NA

NS = Not specified. NA = Non applicable * Only for already inhabited spaces; ** Only new-built dwellings; *** Admitted only for dwellings located within the old town center;

**** Except for the dwellings recovery in accordance with Regional Law April 16 2003 (32).

scarcity of specific national regulations on the matter, highlighting at the same time the rightness and extreme scientific modernity of the statements of the Ministerial Instructions of 1896 (36). The choice of not analysing the Local Hygiene Codes represents, as previously mentioned, a defect of our study, but it gives us the opportunity to remark as positive experiences, such as the Code for Bio-Eco-sustainable Architecture of Empoli Local Health Authority (*ASL 11*) regarding eleven municipalities and amalgamating the principles of different regulatory instruments (44), are to consider virtuous and beneficial. These documents avoid indeed conflicts or contradictions among the different local codes and, referring to a wider geographic area than municipalities, simplify the activities of public health operators, designers, public administrators and, ultimately, citizens. The necessity to act in this way is also underlined by how out-dated the regulatory instruments are: only 25% of Italian communes has a Local Hygiene Code approved or updated after 1993 (35), and some date back to even more than a century (45).

The occurrence and re-occurrence of pathologies related to the quality of dwellings upholds once more the ultimate importance of domestic environment as principal living space (4, 12, 46, 47), and highlights the necessity to provide rigorous requirements with regard to human-built environment, peculiarly residences (48, 49, 50, 51). For this purpose, a deeper analysis of the state of living of Italian population is required, also to define specific risk classes (immigrants, elderly, unemployed...); sizing and regulating the problem of semi-basements used as dwellings has a relevant importance and is desirable that the matter becomes object of further studies. All of the above has also the aim of stimulating administrators

to take initiatives not only to improve populations' living conditions, but also to develop new and updated regulatory instruments for building hygiene, relying on the most recent acquisitions of international scientific literature (52) and guaranteeing the highest standards in public health safeguard.

Riassunto

I seminterrati adibiti a residenza. Considerazioni igienico-sanitarie e disamina normativa

L'attuale contingenza abitativa spinge all'utilizzo a fini abitativi di spazi non destinati normalmente a residenze. Fra questi, per le loro specifiche caratteristiche, hanno grossa rilevanza sanitaria i seminterrati, a causa delle loro importanti ripercussioni sulla salute degli occupanti. Gli autori, muovendo dall'analisi della modesta produzione normativa sia a livello nazionale che regionale, analizzano quali disparità si sono create sul territorio del nostro Paese. L'approfondimento normativo ha riguardato in particolare i regolamenti edilizi dei dieci maggiori comuni italiani per numero di abitanti, considerando se essi prevedevano o meno la possibilità di utilizzo di detti locali ed eventualmente ponendo quali requisiti di ordine igienico-sanitario. Il lavoro si conclude sottolineando la necessità di ulteriori studi per valutare la reale dimensione del problema, ed auspica nuove determinazioni normative ed amministrative a tutela della Salute Pubblica.

References

1. Capasso L, Schioppa F.S. 150 anni di requisiti igienico-sanitari delle abitazioni in Italia. *Ann. Ig.* 2012; **24**(3): 207-16.
2. Dall'Acqua G. *Igiene Ambientale*. Torino: Edizioni Minerva Medica, 1993.
3. Signorelli C, D'Alessandro D, Capolongo S. *Igiene Edilizia ed Ambientale*. Roma: Società Editrice Universo, 2007.
4. Goromosov MS. *Bases physiologiques des normes d'hygiène applicables au logement*. Geneva: OMS, 1968.
5. Jaakkola JJ, Hwang BF, Jaakkola MS. Home dampness and molds as determinants of allergic rhinitis in childhood: a 6-year, population-based cohort study. *Am J Epidemiol* 2010; **172**(4): 451-9.

6. Tham KW, Zuraimi MS, Koh D, Chew FT, Ooi PL. Associations between home dampness and presence of molds with asthma and allergic symptoms among young children in the tropics. *Pediatr Allergy Immunol* 2007; **18** (5): 418-24.
7. Antova T, Pattenden S, Brunekreef B, et al. Exposure to indoor mould and children's respiratory health in the PATY study. *J Epidemiol Community Health* 2008; **62**(8): 708-14.
8. Mendell MJ, Mirer AG, Cheung K, Tong M, Douwes J. Respiratory and allergic health effects of dampness, mold, and dampness-related agents: a review of the epidemiologic evidence. *Environ Health Perspect* 2011; **119**(6): 748-56.
9. Thomson H, Petticrew M, Morrison D. Health effects of housing improvement: systematic review of intervention studies. *BMJ* 2007; **323**: 187-90.
10. Agents Classified By The IARC Monographs, Volumes 1-106, update 7 November 2012.
11. www.epa.gov/radon/aboutus.html
12. Lowry S. Housing. *BMJ* 1991; **303**(6806): 838-40.
13. Krieger J, Higgins DL. Housing and health: time again for public health action. *Am J Public Health* 2002; **92**(5): 758-68.
14. Hood E. Dwelling disparities: how poor housing leads to poor health. *Environ Health Perspect* 2005; **113**(5): A310-7.
15. D'Alessandro D, Raffo M. Adeguare le risposte ai nuovi problemi dell'abitare in una società che cambia. *Ann Ig* 2011; **23**(3): 267-74.
16. Capasso L, Flacco ME, Manzoli L, Basti A. Analisi delle differenze fra i requisiti igienico-sanitari dei sottotetti abitabili nelle diverse regioni italiane. *Ann Ig* 2013; **25**(2): 159-65.
17. De Noni L, Manservigi S. Popolazione disagiata e interventi sulle abitazioni malsane a Verona. *SNOP* 2005; **2**: 29-31.
18. Laurita V, Decorato A; Di Rosa E, Bordi L, Raffo M, D'Alessandro D. Idoneità alloggiativa nel XX Municipio di Roma. Andamento del fenomeno nel triennio 2009-2011. *Ann Ig* 2013; **25**(Suppl 1): 501-7.
19. Howden-Chapman P, Saville-Smith K, Crane J, Wilson N. Risk factors for mold in housing: a national survey. *Indoor Air* 2005; **15**: 469-76.
20. Thomson H, Thomas S, Sellstrom E, Petticrew M. The health impacts of housing improvement: a systematic review of intervention studies from 1887 to 2007. *AM J Public Health* 2009; **99** suppl 3: S681-92
21. World Health Organization (WHO). Closing the gap in a generation. Health equity through action on the social determinants of health. Geneva: WHO, 2008.
22. Decreto Presidente della Repubblica 06 giugno 2001, n. 380. Testo unico delle disposizioni legislative e regolamentari in materia edilizia.
23. Decreto Ministero della Sanità 05 luglio 1975. Modificazioni delle Istruzioni Ministeriali del 20 giugno 1896, relativi all'altezza minima ed ai requisiti igienico-sanitari principali dei locali di abitazione.
24. www.comunitaliani.com
25. Regolamento Generale edilizio del Comune di Roma (testo coordinato ed aggiornato). Delibera del 18 agosto 1934, n. 5261.
26. Regolamento Edilizio del Comune di Milano. Testo approvato dal Consiglio Comunale il 20 luglio 1999.
27. Regolamento edilizio del Comune di Napoli, Assessorato all'edilizia. Napoli, settembre 1999.
28. Regolamento Edilizio, approvato con deliberazione del Consiglio Comunale in data 20 dicembre 2004, come modificato con deliberazione del Consiglio Comunale in data 10 ottobre 2005.
29. Regolamento Edilizio del Comune di Palermo.
30. Regolamento Edilizio del Comune di Genova.
31. Regolamento Urbanistico Edilizio in attuazione della Legge regionale 24 marzo 2000 n. 20, approvato il 20 aprile 2009 con deliberazione n. 137/2009 PG 83079/2009.
32. Regolamento Edilizio 2009, Delibera del Consiglio Comunale n. 91 del 19 aprile 1999, modificato con Delibera del Consiglio Comunale n. 86 del 26 ottobre 2009.
33. Regolamento edilizio della città di Bari.
34. Regolamento Edilizio del Comune di Catania.
35. Signorelli C, Capolongo S, Carreri V, Fara GM. The adoption of local hygiene and building regulations and their update in a sample of 338 Italian municipalities. *Ann Ig* 1999; **11**(5): 397-403.
36. Istruzioni Ministeriali del 20 giugno 1896. Compilazione dei regolamenti locali sull'igiene del suolo e dell'abitato.
37. Decreto Legislativo 09 aprile 2008 n. 81. Testo Unico sulla salute e sicurezza sul lavoro.
38. Legge Regionale (Sardegna) 21 novembre 2011, n. 21 Modifiche e integrazioni alla legge regionale n. 4 del 2009, alla legge regionale n. 19 del

- 2011, alla legge regionale n. 28 del 1998 e alla legge regionale n. 22 del 1984, ed altre norme di carattere urbanistico.
39. Legge Regionale (Sicilia) del 16 aprile 2003, n. 4. Disposizioni programmatiche e finanziarie per l'anno 2003.
 40. Legge Regionale (Umbria) 18 febbraio 2004, n. 1. Norme per l'attività edilizia.
 41. Regione dell'Umbria. Indirizzi in riferimento al cambio di destinazione d'uso a residenza e per servizi dei vani posti al piano sottotetto e terreno di edifici esistenti (D.G.R. del 16 marzo 2005, n. 452).
 42. Legge Regionale (Calabria) 10 febbraio 2012, n. 7. Modifiche ed integrazioni alla legge regionale 11 agosto 2010, n. 21, nonché disposizioni regionali in attuazione del decreto legge 13 maggio 2011, n. 70 convertito, con modificazioni, dalla legge 12 luglio 2011, n. 106.
 43. Legge Regionale (Puglia) 15 novembre 2007, n. 33. Recupero dei sottotetti, dei porticati, di locali seminterrati e interventi esistenti e di aree pubbliche non autorizzate.
 44. Regolamento per l'edilizia bio-eco sostenibile, comuni di Capraia e Limite, Castelfiorentino, Castelfranco di Sotto, Cerreto Guidi, Certaldo, Empoli, Fucecchio, Gambassi Terme, Montañone, Montespertoli, Montopoli, Valdarno, Montelupo Fiorentino, San Miniato, Santa Croce sull'Arno, Vinci.
 45. Regolamento Locale di Igiene. Chieti, 1902.
 46. De Martino A. Linee-guida per la tutela e la promozione della salute negli ambienti confinati. *Ig San Pubbl* 2001; **57**(4): 407-14.
 47. Lowry S. An introduction to housing and health. *BMJ* 1989; **299**(6710): 1261-2.
 48. *Health Principles of housing*. Geneva: WHO, 1989.
 49. Gubernskii IuD, Kalinina NV, Orlova NS, Mel'nikova AI, Gaponova EB. Hygienic bases of certification of residential objects. *Gig Sanit*. 2006; **1**: 27-30.
 50. Baglioni A, Piardi S. *Costruzioni e salute*. Milano: F. Angeli, 1993.
 51. Jacobs DE, Kelly T, Sobolewski J. Linking public health, housing, and indoor environmental policy: success and challenges at local and federal agencies in the United States. *Environ Health Prospect* 2007; **115**(6): 976-82.
 52. Braubach M. Key challenges of housing and health from WHO perspective. *Int J Public Health* 2011; **56**(6): 579-80.

Corresponding author: Dott. Lorenzo Capasso, Department of Medicine and Aging Sciences, "G. d'Annunzio" University, Via dei Vestini 31, 66100 Chieti, Italy
e-mail: lmcapasso@unich.it