

Health status, diseases and vaccinations of the homeless in the city of Palermo, Italy

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Abstract

Introduction. In Italy, as in the rest of the world, the number of homeless people is increasing considerably. Many of them suffer from chronic conditions, mental health problems and addiction to alcohol, drugs or smoking, and need complex medical care. Their health status is often exacerbated by greater difficulty in accessing primary care. The aim of the present study was to assess health conditions of homeless people living in Palermo, Southern Italy, and to find ways to limit the spread of common infectious diseases that can be prevented by vaccination.

Materials and Methods. A self-administered questionnaire was distributed. The questionnaire was structured into two parts including an introduction with socio-demographic information, and a second part investigating health status, chronic diseases and vaccinations. A multivariable logistic regression model was used and adjusted Odds Ratios (aOR) are presented.

Results. The sample consisted of 52 homeless, 35 (67.3%) of whom were male and the most represented age class (55.8%) was < 50 years of age. The average age of the sample was 49.6 years (SD ± 15.2) and 88.5% were born in Italy. A multivariable logistic regression model based on 52 observations was used. The analysis showed that the female gender was significantly associated with: not performing regular physical activity (aOR 4.14, 95% C.I. 1.20 - 14.32, $p = 0.025$), suffering from chronic diseases (aOR 3.52, 95% C.I. 1.02 - 12.11, $p = 0.046$) and taking medicines (aOR 3.95, 95% C.I. 1.14 - 13.64, $p = 0.030$).

Conclusions. This particularly fragile population is exposed to diseases that are largely preventable or curable through a wider and more early access to care by local health facilities with a subsequent reduction in the worsening of clinical outcomes and related social costs.

Introduction

The increasing number of the new poor, consequent to the economical crisis having occurred in Italy since 2008, has led to emerging public health needs. The term

“homeless” refers to vagabonds who live in the margin of society, without a home or defined occupation; they were once called *barboni* in Italian slang (literally translated by “long-bearded men” and corresponding in English to “tramps”, “bums” and “hobos”),

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with a negative and stigmatizing meaning coming from distinctive characteristics of their shabby, tattered appearance.

They are people without a permanent home, who live on the streets or in makeshift accommodations and who sometimes resort to dormitories or night shelters. Today the term “barbone” has been replaced also in Italian language by the expression “homeless” (1).

The condition of homelessness can be due to intrinsic factors, such as a mental or physical disorder, or to extrinsic and contingent factors, such as loss of work.

These causes are strongly interconnected: the loss of work can lead to a mental or physical disorder, as well as the onset of an illness may lead to loss of work. As demonstrated by previous studies, living in a public space means being in constant alert and continuous psycho-social discomfort (2, 3). Therefore, the road not only increases the state of anxiety and discomfort compared to the general population, but also fosters the manifestation of severe psychiatric disorders: psychosis, personality disturbance, dependence on alcohol and smoking (4).

Homeless people are not passively subjected to the process of social exclusion, but rather they implement active strategies aimed at adaptation to street life, by modifying their physical appearance and re-formulating the imprint of their character. For this reason it is difficult to propose adequate psycho-social and medical-health assistance in order to contrast the process of exclusion from society (5).

Similar problems are present in other countries as well, with estimates of 100 million homeless people all over the world, according to the latest report of the United Nations Organization (UNO) (6). More than 3 million homeless live in the US, including war veterans, unemployed, single mothers, people with mental disorders (6). In Italy, according to surveys conducted by the National Institute of Statistics (ISTAT)

regarding life condition of people living in extreme poverty, the number of homeless has been increasing significantly (7). Most of them live in the Northern regions (56%); the remaining 23% and 20% live in Central and in Southern Italy regions, respectively. Geographical distribution depends on the provision of social services and on the concentration of population in large cities.

The majority of homeless are males (85.7%), aged less than 54 years old, and foreigners (58.2%) (7).

Harris et al. found that a combination of traumatic events played a significant role in determining the homelessness condition, including the loss of stable employment, separation from spouse and children and health problems (disability, chronic diseases or addictions) (8). The first nationwide survey aimed at quantifying this social phenomenon in Italy, promoted by the Ministries of Health, Labor and Social Policies, ISTAT, the Italian Federation of Organisms for Homeless People (Fio.PSD) and Caritas (the major charity association), dates back to 2011 (9).

Homeless need complex medical, psychological and social care since their health status is frequently burdened by chronic diseases, mental disturbances and drugs, alcohol or smoking addiction, yielding higher mortality rates than those of people living in housing communities (10-14). Greater difficulty in accessing primary care in comparison with the general population may exacerbate homeless health (15, 16), with no substantial differences between countries with or without health insurance coverage (17, 18). Voluntary initiatives such as the 3 days “Marathon of Prevention” held in Palermo (Sicily) thanks to the help of the Italian Red Cross and the Provincial Health Authority (ASP) n° 6 of Palermo, developed in the context of Hackathon Health Technology Assessment - *Never Stop Learning* (19), can be very effective in meeting homeless basic needs.

On this occasion, anti-pneumococcal and flu vaccines were administered after recording medical history to investigate any contraindications and signing an informed consent. In order to cope with any possible allergic manifestation or side effects, the medical volunteers were provided with drugs to be used in case of allergic reactions (Corticosteroids, Antihistamines and Adrenaline ampoules). The minimum emergency equipment established by the UNI EN 1789 standard, including medical and electro-medical devices, were present on the ambulance:

- resuscitation kit: semi-automatic defibrillator, aspirator, clothes-scissor shears, oropharyngeal cannulas and self-expandable flask (AMBU);
- oxygen therapy material: masks with reservoirs and tanks, both fixed and portable;
- individual protection devices: gloves, masks, goggles, sterile gowns and protective suits diagnostic instruments, including sphygmomanometer, phonendoscope, oximeter, and multi-parameter monitor.

The main objective of the present study was to assess the health condition of the homeless in Palermo and to promote and support immunizations among them. In particular, our aim was how to protect them from common infectious diseases which can be prevented by vaccination (influenza and pneumococcal infections). Furthermore, in this paper we also present data on homeless' vaccination status.

Materials and methods

The study employed a cross-sectional study design. This project started up from the "Street Unit" ("Unità di Strada") activity developed by Italian Red Cross in Sicily. It consists in a free of charge support offered to the homeless, both Italian and foreigner. The healthcare workers, involved on voluntary

basis, were at least a physician, a nurse and a rescuer. Every night, the volunteer team provided health assistance – i.e. medical examination, medication and drugs if necessary – and social support, – such as blankets, hot drinks and other primary goods - covering the same itinerary. The area covered by the Red Cross activity is the Palermo city center, where usually there are approximately 75 homeless. Specifically for this project, the volunteer team of the Italian Red Cross, together with the cultural-linguistic mediator and other Local Health Unit workers, have provided to the homeless informations about the flu and pneumococcal infections, their complications, thus offering to perform the vaccination. The counselling was provided in an area with sufficient privacy; in particular, we used a medical camper, which was adapted in order to provide first aid and first level examinations. Later, after acquisition of informed consent, a questionnaire was administered. The Local Health Units offered vaccines, notably, we received 60 anti-pneumococcal and 60 anti-influenza vaccines.

The questionnaires were administered – during three consecutive nights – in January 2018 to the homeless of Palermo City, Sicily, Italy. Due to the great difficulty in distributing the questionnaire, this is a relatively small convenience sample. However, considering the entire population size, our sample represents more than 75% of the population. The self-administered questionnaires distributed were anonymous and on voluntary basis. It was designed by the authors for this study and consisted of 23 questions, was structured in two parts plus an introduction asking for socio-demographic information (gender, age, citizenship, education level, weight and height). In the first part of the survey, the questions of the A.U.D.I.T.-C (*Alcohol Use Disorders Identification Test-Consumption*) test were administered. The A.U.D.I.T.-C test consists of three questions that investigate the

possible alcohol consumption (20), and it has already been used by the authors in a study for the evaluation of the risky consumption of alcohol in a sample of University students (21). Each question has five possible answers, which are assigned a score from 0 to 4, from the sum of the scores of the individual questions a final score is obtained, according to which the subjects are categorized as subjects “at risk” or “not at risk”. A score equal to or greater than 5 for the male sex, and equal to or greater than 4 for the females, sets for a possible risky alcohol consumption. The other questions of the second part are the following (see Table 1, Table 2 and Table 3 for more details): “Do you currently smoke?”, “Do you perform regular physical activity?”, “Do you have chronic diseases?”, “Usually taking any medicines?”, “Do you have allergies to drugs or foods?”, “Do you think you are informed about vaccinations and preventable diseases?”, “Do you have a family doctor?”, “Did you happen to have an influenza episode in the last 5 years?”, “In the last 5 years, how many times have you been vaccinated against seasonal flu?”, “Do you think there is adequate attention to homeless on the part of the Local Health Authority?”. In the second part we also investigated about perceived health status, reported vaccinations and chronic diseases.

The Body Mass Index (BMI, formula: weight in Kg / height² in meters) of each interviewed was calculated based on the weight and height variables reported (22), then the interviewed was assigned to the reference category in relation to the value of the BMI: normal, underweight, overweight, obese. Three variables have been dichotomized: 1) education level, “Low” if “None”, “Elementary license” or “Middle School diploma” reported, “Medium-High” if “High school graduation” or “University degree”; 2) age, in age class < 50 years old or ≥ 50 years old; 3) citizenship in “Italian” and “Other”.

Categorical variables were summarized as proportions and analyzed by Fisher’s exact test. A multivariable logistic regression model was used. For each dependent variable selected adjusted Odds Ratios (aOR) are presented, considering the male gender as a reference category, net of the effect attributable to the age class and the education level (dichotomized in low and medium-high); considering the age class < 50 year-olds as the reference category, net of the effect attributable to the gender and the education level (dichotomized in low and medium-high); considering the “medium-high” education level as the reference category, net of the effect attributable to the gender and the age class. The level of significance chosen for the statistical analysis was 0.05. The data was analyzed using statistical software STATA® version 14(23).

Results

The population was constituted by 75 homeless, however we were able to contact 69 persons (92% of the whole sample), 52 of whom agreed to take part in the study, with a response rate of 75.4%. Along this line, our sample consists of 52 homeless, of whom 35 (67.3 %) are male and the most representative age class (55.8 %) is lower than 50 years old. The average age of the sample is 49.6 years (SD ± 15.2) and 88.5% were born in Italy. The whole sample underwent influenza and anti-pneumococcal vaccination. Of the 52 vaccinated subjects, no one experienced allergic post-vaccination reactions and no one reported fever or joint pain within the next 48 hours. The response rate is 76.5%. The sample characteristics are described in Table 1.

84.6 % of respondents have a low educational level, 50.0 % currently smoke, 63.5% perform regular physical activity (mostly walking), and 90.4% of respondents

Table 1 - Description of the sample.

Variables	N (%)	
Gender	Female	17 (32.7)
	Male	35 (67.3)
Mean age	49.6 (SD ± 15.2)	
Age class	< 50 years old	29 (55.8)
	≥ 50 years old	23 (44.2)
Citizenship	Italian	46 (88.5)
	Other	6 (11.5)
Body Mass Index Categories	Normal	31 (59.6)
	Overweight	13 (25.0)
	Obese	4 (7.7)
	Underweight	4 (7.7)
Educational level	Medium-High *	8 (15.4)
	Low **	44 (84.6)
Risky alcohol consumption (A.U.D.I.T.- C test)	Yes	47 (90.4)
	No	5 (9.6)
Do you currently smoke?	Yes	26 (50.0)
	No	26 (50.0)
Do you perform regular physical activity?	Yes	33 (63.5)
	No	19 (36.5)
Perceived health status	Medium-High	19 (36.5)
	Low	33 (63.5)
Do you have chronic diseases?	Yes	23 (55.8)
	No	29 (44.2)
Usually taking any medicines?	Yes	22 (42.3)
	No	30 (57.7)
Do you have allergies to drugs or foods?	Yes	6 (11.5)
	No	46 (88.5)
Do you think you are informed about vaccinations and preventable diseases?	Yes	23 (44.2)
	No	29 (55.8)
Do you have a family doctor?	Yes	29 (55.8)
	No	23 (44.2)
If you have a family doctor, do you often go to the clinic?*	Yes	13 (44.8)
	No	16 (55.2)
Did you happen to have an influenza episode in the last 5 years?	Yes	28 (53.9)
	No	24 (46.1)
In the last 5 years, how many times have you been vaccinated against seasonal flu?	Never	33 (63.5)
	At least 1 time	19 (36.5)
Do you think there is adequate attention to homeless on the part of the Local Health Authority?	Yes	5 (9.6)
	No	47 (90.4)

* Medium-High educational level = High school graduation (7) and University degree (1)

**Low Educational level = None (5), Elementary license (15) and Middle School diploma (24)

*Based on 29 observations

report a risky alcohol consumption according to AUDIT-C test. About BMI categories, 25.0% are overweight and 7.7% obese. 29 (55.8 %) of respondents have a family doctor and 44.8 % of them regularly attend the clinic. 44.3% of the sample is considered informed about vaccinations and preventable diseases but, in the last 5 year, 63.5 % of respondents had never been vaccinated against seasonal flu and 53.8% have had an influenza episode in the last 5 years. Only 9.6% of the sample think that Local Health Authority has an adequate attention to homeless' condition. 63.5 % report a low perceived health status, 55.8 % have a chronic disease and 42.3 % is taking any medicines (only 11.5 % have allergies to drugs or foods).

Reported vaccinations during life and reported chronic diseases are shown in Table 2 and Table 3 (multiple responses can be selected for both variable). 36.5% of the sample report having been vaccinated against flu, 26.9% against Hepatitis B, 21.1 % against Meningococcus (unspecified serotype) and 17.3% against tetanus. 28.0% of the sample suffer from cardiovascular diseases, 16.0% from endocrinological and neurological diseases.

Tables 4, 5 and 6, shows the results of the bivariate analyzes, therefore association between selected responses in relation to gender (Table 4), age class (Table 5) and perceived health status (Table 6). In relation to gender (Table 4) from the analysis of data emerges that the males perform regular physical activity more than women and take less medicines. In relation to the different age groups (Table 5), the age group of ≥ 50 years old belong to upper risk classes for risky alcohol consumption. As shown in Table 6, those who have a medium-high perception of health status are more informed about vaccinations and preventable diseases and consult their family doctor more often. The totality of the sample with a low perception of health status think there is inadequate attention to homeless on the

Table 2 - Reported vaccinations (multiple responses can be selected).

Vaccination	N (%)
Flu	19 (36.5)
Hepatitis B	14 (26.9)
Meningococcal (unspecified serotype)	11 (21.2)
Tetanus	9 (17.3)
Diphtheria	7 (13.5)
Poliomyelitis	5 (9.6)
Measles, Mumps, Rubella	4 (7.7)
Pertussis	4 (7.7)
HPV	3 (5.8)
Haemophilus influenzae	1 (1.9)
Chicken pox	1 (1.9)

Table 3 - Reported chronic diseases (multiple responses can be selected)*.

Chronic diseases	N (%)
Cardiovascular diseases	7 (28.0)
Endocrinological diseases	4 (16.0)
Neurological diseases	4 (16.0)
Depression	3 (12.0)
Gastroenterological diseases	3 (12.0)
Cancer	1 (4.0)
Respiratory diseases	1(4.0)
Alcoholism	1 (4.0)
Urological diseases	1 (4.0)

* three interviewed reported concomitant chronic disease

part of the Local Health Authority. Table 7 shows adjusted Odds Ratio (aOR) for Female vs Male, age class ≥ 50 years old vs < 50 years old and educational level Low vs Medium-High (male is reference, Age class < 50 years old is reference, educational level Medium-High is reference). A multivariable logistic regression model was used based on 52 observations. The analysis shows that female gender is significantly associated with: "do not perform regular physical activity" (aOR 4.14, 95% C.I. 1.20 - 14.32,

Table 4 - Frequency, percentage, and association between selected responses and gender. Used Fisher's exact test.

		Female N (%)	Male N (%)	p-value
Age class	< 50 years old	10 (58.8)	19 (54.3)	1.000
	≥ 50 years old	7 (41.2)	16 (45.7)	
Citizenship	Italian	16 (94.1)	30 (85.7)	0.650
	Other	1 (5.9)	5 (14.3)	
Educational level, dichotomized	Medium-High	2 (11.8)	6 (17.1)	1.000
	Low	15 (88.2)	29 (82.9)	
Risky alcohol consumption (A.U.D.I.T.-C test)	No	17 (100.0)	30 (85.7)	0.159
	Yes	0 (0.0)	5 (14.3)	
Do you currently smoke?	No	11 (64.7)	15 (42.9)	0.237
	Yes	6 (35.3)	20 (57.1)	
Do you perform regular physical activity?	Yes	7 (41.2)	26 (74.3)	0.032
	No	10 (58.8)	9 (25.7)	
Reported health status	Medium-High	6 (35.3)	13 (37.1)	1.000
	Low	11 (64.7)	22 (62.9)	
Do you have chronic diseases?	No	6 (35.3)	23 (65.7)	0.073
	Yes	11 (64.7)	12 (34.3)	
Usually taking any medicines?	No	6 (35.3)	24 (68.6)	0.036
	Yes	11 (64.7)	11 (31.4)	
Do you have allergies to drugs or foods?	No	14 (82.4)	32 (91.4)	0.379
	Yes	3 (17.6)	3 (8.6)	
Do you think you are informed about vaccinations and preventable diseases?	Yes	6 (35.3)	17 (48.6)	0.393
	No	11 (64.7)	18 (51.4)	
Do you have a family doctor?	Yes	10 (58.8)	19 (54.3)	1.000
	No	7 (41.2)	16 (45.7)	
If you have a family doctor, do you often go to the clinic?	Yes	4 (40.0)	9 (47.4)	1.000
	No	6 (60.0)	10 (52.6)	
Did you happen to have an influenza episode in the last 5 years?	No	9 (52.9)	15 (42.9)	0.562
	Yes	8 (47.1)	20 (57.1)	
In the last 5 years, how many times have you been vaccinated against seasonal flu?	At least 1 time	7 (41.2)	12 (34.3)	0.761
	Never	10 (58.8)	23 (65.7)	
Do you think there is adequate attention to homeless on the part of the Local Health Authority?	Yes	0 (0.0)	5 (14.3)	0.159
	No	17 (100.0)	30 (85.7)	

p=0.025), “have chronic diseases” (aOR 3.52, 95% C.I. 1.02 - 12.11, p=0.046) and “taking medicines” (aOR 3.95, 95% C.I. 1.14 - 13.64, p=0.030).

Discussion

Since the year 2008, several European countries, Italy included, faced one of the

Table 5 - Frequency, percentage, and association between selected responses and age class. Used Fisher's exact test.

		< 50 years old N (%)	≥ 50 years old N (%)	p-value
Gender	Female	10 (34.5)	7 (30.4)	1.000
	Male	19 (65.5)	16 (69.6)	
Citizenship	Italian	24 (82.8)	22 (95.7)	0.210
	Other	5 (17.2)	1 (4.3)	
Educational level, dichotomized	Medium-High	6 (20.7)	2 (8.7)	0.278
	Low	23 (79.3)	21 (91.3)	
Risky alcohol consumption	No	29 (100.0)	18 (78.3)	0.013
	Yes	0 (0.0)	5 (21.7)	
Do you currently smoke?	No	15 (51.7)	11 (47.8)	1.000
	Yes	14 (48.2)	12 (52.2)	
Do you perform regular physical activity?	Yes	17 (58.6)	16 (69.6)	0.563
	No	12 (41.4)	7 (30.4)	
Reported health status	Medium-High	11 (37.9)	8 (34.8)	1.000
	Low	18 (62.1)	15 (65.2)	
Do you have chronic diseases?	No	17 (58.6)	12 (52.2)	0.780
	Yes	12 (41.4)	11 (47.8)	
Usually taking any medicines?	No	17 (58.6)	13 (56.5)	1.000
	Yes	12 (41.4)	10 (43.5)	
Do you have allergies to drugs or foods?	No	25 (86.2)	21 (91.3)	0.682
	Yes	4 (13.8)	2 (8.7)	
Do you think you are informed about vaccinations and preventable diseases?	Yes	14 (48.3)	9 (39.1)	0.581
	No	15 (51.7)	14 (60.9)	
Do you have a family doctor?	Yes	16 (55.2)	13 (56.5)	1.000
	No	13 (44.8)	10 (43.5)	
If you have a family doctor, do you often go to the clinic?	Yes	7 (43.8)	6 (46.2)	1.000
	No	9 (56.2)	7 (53.8)	
Did you happen to have an influenza episode in the last 5 years?	No	13 (44.8)	11 (47.8)	1.000
	Yes	16 (55.2)	12 (52.2)	
In the last 5 years, how many times have you been vaccinated against seasonal flu?	At least 1 time	13 (44.8)	6 (26.1)	0.247
	Never	16 (55.2)	17 (73.9)	
Do you think there is adequate attention to homeless on the part of the Local Health Authority?	Yes	2 (6.9)	3 (13.0)	0.644
	No	27 (93.1)	20 (87.0)	

most devastating economic crisis, that is still perpetuating until now. Consequences of this crisis have been principally related to the people's employment status and to the reduction of State's investments, also including investments on health. A combination of these two aspects affected health-related outcomes and contributed to

the increase of health inequalities (24). As for homeless studies on gender differences, it is clear that most of them belong to the male category. Despite this, there is an increase in women and families more than in the past. The reasons for these differences are related to aspects of public and private policies and to the greater family support that women

Table 6 - Frequency, percentage, and association between selected responses and Perceived health status. Used Fisher's exact test.

		Medium-High N (%)	Low N (%)	p-value
Gender	Female	6 (31.6)	11 (33.3)	1.000
	Male	13 (68.4)	22 (66.7)	
Citizenship	Italian	16 (84.2)	30 (90.9)	0.656
	Other	3 (15.8)	3 (9.1)	
Educational level, dichotomized	Medium-High	3 (15.8)	5 (15.1)	1.000
	Low	16 (84.2)	28 (84.9)	
Risky alcohol consumption	No	17 (89.5)	30 (90.9)	1.000
	Yes	2 (10.5)	3 (9.1)	
Do you currently smoke?	No	9 (47.4)	17 (51.5)	1.000
	Yes	10 (52.6)	16 (48.5)	
Do you perform regular physical activity?	Yes	14 (73.7)	19 (57.6)	0.371
	No	5 (26.3)	14 (42.4)	
Age class	< 50 years old	11 (57.9)	18 (54.5)	1.000
	≥ 50 years old	8 (42.1)	15 (45.5)	
Do you have chronic diseases?	No	11 (57.9)	18 (54.5)	1.000
	Yes	8 (42.1)	15 (45.5)	
Usually taking any medicines?	No	12 (63.2)	18 (54.5)	0.576
	Yes	7 (36.8)	15 (45.5)	
Do you have allergies to drugs or foods?	No	15 (78.9)	31 (93.9)	0.175
	Yes	4 (21.1)	2 (6.1)	
Do you think you are informed about vaccinations and preventable diseases?	Yes	13 (68.4)	10 (30.3)	0.010
	No	6 (31.6)	23 (69.7)	
Do you have a family doctor?	Yes	13 (68.4)	16 (48.5)	0.247
	No	6 (31.6)	17 (51.5)	
If you have a family doctor, do you often go to the clinic?	Yes	9 (69.2)	4 (25.0)	0.027
	No	4 (30.8)	12 (75.0)	
Did you happen to have an influenza episode in the last 5 years?	No	9 (47.4)	15 (45.5)	1.000
	Yes	10 (52.6)	18 (54.5)	
In the last 5 years, how many times have you been vaccinated against seasonal flu?	At least 1 time	6 (31.6)	13 (39.4)	0.766
	Never	13 (68.4)	20 (60.6)	
Do you think there is adequate attention to homeless on the part of the Local Health Authority?	Yes	5 (26.3)	0 (0.0)	0.004
	No	14 (73.7)	33 (100.0)	

Table 7 - Multivariable logistic regression. Adjusted odds ratio for Female vs Male, age class ≥ 50 years old vs < 50 years old and educational level Low vs Medium-High (male is reference, Age class < 50 years old is reference, educational level Medium-High is reference). Based on 52 observations.

Dependent variable	Female vs Male	≥ 50 years old vs < 50 years old	Educational level Low vs Medium-High
	aOR [±] (95% CI)	aOR [±] (95% CI)	aOR [±] (95% CI)
Do you currently smoke? Yes	0.41(0.12 - 1.37)	1.13 (0.36 - 3.51)	1.06 (0.22 - 5.03)
Do you perform regular physical activity? No	4.14* (1.20-14.32)	0.63 (0.18 - 2.17)	0.90 (0.17 - 4.71)
Reported health status: Low	1.09 (0.32 - 3.67)	1.15 (0.36 - 3.66)	1.01 (0.21 - 4.93)
Do you have chronic diseases? Yes	3.52* (1.02 - 12-11)	1.28 (0.40 - 4.15)	2.51 (0.42 - 15.01)
Usually taking any medicines? Yes	3.95* (1.14 - 13.64)	1.07 (0.33 - 3.52)	2.35 (0.39 - 14.19)
Do you have allergies to drugs or foods? Yes	2.62 (0.44 - 15.72)	0.70 (0.11 - 4.50)	0.28 (0.04 - 2.02)
Do you think you are informed about vac- cinations and preventable diseases? No	1.84 (0.55 - 6.21)	1.60 (0.51 - 5.04)	0.60 (0.12 - 3.02)
Do you have a family doctor? No	0.84 (0.36 - 2.73)	0.97 (0.32 - 2.98)	0.78 (0.67 - 3.61)
Did you happen to have an influenza episode in the last 5 years? Yes	0.62 (0.19 - 2.04)	0.77 (0.25 - 2.42)	2.46 (0.50 - 12.18)
In the last 5 years, how many times have you been vaccinated against seasonal flu? Never	0.81 (0.24 - 2.78)	2.53 (0.75 - 8.52)	0.43 (0.07 - 2.53)
Do you think there is adequate attention to homeless on the part of the Local Health Authority? No	Omitted	0.67 (0.09 - 4.73)	Omitted

* adjusted Odds Ratios (aOR) by age class, gender and educational level

* p-value < 0.05

enjoy compared to single and adult males (15). In this context the authors considered it useful to compare the two groups in order to highlight any differences in terms of access to care, the presence of chronic diseases and regular physical activity.

According to ISTAT, the total number of the homeless in Italy did not change significantly in 2014 compared to 2011 (7), even though the number of homeless living in south and islands increased compared to other areas. In this period also the characteristics of this population did not change. Actually, 41% of the homeless are Italian, male, and in the majority of the cases are younger than 50 years, data confirmed also by our results. Nevertheless, the increase in the average age, for both

Italians and foreigners, might increase the prevalence of some chronic diseases such as cardiovascular and cerebral diseases. Moreover, homeless' health could also be affected by several other conditions such as anxiety and depression symptoms, due to the low economic conditions, unhealthy lifestyles such as smoking and alcohol drinking (25). Moreover, low economic level is also connected with infectious diseases, with worse disease's outcomes (26) and under-utilization of services. To the best of our knowledges, this is the first study carried on in Italy aimed to evaluate the health condition of the homeless living in a large city, offering them the possibility to get vaccinated free of charge. The immunization status against the main infectious diseases

preventable by vaccination has always been difficult to evaluate in the weakest sections of the population (27). According to our results, the homeless represent a very vulnerable group of population. Actually, they are exposed to several risk factor such as low educational level (87%), alcohol consumption (90%), smoking habits (50%), be overweight/obese (32%), with at least one chronic disease (55%) and underutilizing health services (only 44% of our sample usually go to the GP). According to WHO Working Group for Risk Factors for Severe H1N1 pdm infection, people with chronic diseases, obesity and from a social vulnerable group are at risk to develop severe outcomes after influenza infection (28). The “Marathon of Prevention” initiative meets some of the objectives proposed by the National Vaccination Prevention Plan (PNPV) 2017-2019, i.e. increasing awareness about vaccinations and countering inequalities by promoting vaccine interventions in groups of marginalized or particularly vulnerable populations (29). Only 55% of the homeless sampled in our survey stated they were enrolled in a family doctor register, confirming the greater difficulties they suffer in benefiting from General Practitioners’ care in comparison with the general population, confirming what previous studied suggested (18, 20). Influenza vaccination and anti-pneumococcal vaccination are offered actively and free of charge in Italy (29). In particular, the anti-pneumococcus is offered to all subjects aged over 64 years, in pediatric age (3rd-5th and 11th month of life) and to all subjects at risk. On the other hand, influenza vaccination is offered to all those at risk. Unlike other vaccinations planned by the “life calendar” which should be administered in public vaccination clinics, influenza vaccination and anti-pneumococcus for adults is also offered by general practitioners. However, although 55% of the homeless included in our study had their own General Practitioner, and could therefore have been

vaccinated against the flu, 63% of them have never received vaccination in the previous 5 years. Bivariate analysis showed correlation between medium-high perception of personal health and greater health literacy about vaccinations, preventable diseases and greater frequency in consulting family doctor. On the other hand, those with a low perception of personal health thought that the attention paid to the homeless by the local health authorities was inadequate.

The following limits can be identified in our study: cross-sectional design did not allow the inference on causal associations between the factors investigated as potential determinants; the limited number of questions did not adequately investigate alcohol consumption and health risk factors; moreover, the small sample of only one city in Southern Italy did not allow the generalization of results to the remaining Italian territory. Another important limitation was due to the lack of any medical written documentation provided by the homeless who self-reported previous vaccinations carried out. Questionnaire-based surveys could be influenced by social desirability bias (30, 31) and recall bias (32). However, the questionnaire used in our study, in addition to being an economic and manageable tool, has already been used in the literature. The extension of the study into a multicentric survey can be desirable in order to provide a homogeneous and more detailed view of the phenomenon in different geographical areas, thus standardizing the results. Particular attention should be paid to the health needs of the homeless since the longer they lived on the street, the lower was their probability to benefit from family doctors’ care (15). Various studies have shown that when homeless persons get sick, they prefer seeking for healthcare in emergency rooms or through Non Governmental Organizations (NGOs) first-aid stations before going to outpatient doctors (3, 5, 13, 15). Actually, in Italy, the

National Health System offers a free-of-charge health service for all people, however there are a few special health programmes offered ad hoc to the homeless. The typical social services offered to the homeless are soup kitchens and night shelters. While there are no structured health programmes in order to prevent or treat diseases, despite the fact that the PNPV 2017-2019 contrasts the inequality, through vaccine's promotion campaign among groups of people hard to reach and by including vaccines in the "essential levels of care" (29). Furthermore, Article 32 of the Italian Constitution declares that the protection of health is a fundamental human right for every individual and an interest of the community. Although these important normative and theoretical principles, little has been done in terms of health planning yet. In order to improve the quality of life of the homeless and reduce healthcare economic waste, it would be advisable to develop structured preventive health interventions addressed to these people, improving their living conditions and allowing a more equitable and accessible public health.

Conclusions

Although Italy is among the countries that have reached a better quality of life, deep dishomogenelties affect the population (33). The relevance and complexity of the social situation of homeless people, often affected by chronic diseases related to social, economic and relational determinants, draws attention to this phenomenon destined to have a strong impact on health policies and services. This particularly fragile population is exposed to largely preventable or curable diseases through a wider and earlier access to care provided by local health facilities, improving clinical outcomes and reducing social costs. In this context, the "Marathon of Prevention" initiative in Palermo, Sicily,

was aimed to stress the need for greater knowledge of this phenomenon taking into account the social determinants that exert a strong influence on the health status of such people.

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Riassunto

Stato di salute, malattie e vaccinazioni nei senzatetto della città di Palermo

Introduzione. Un tempo "barboni", oggi senzatetto, il loro numero sta aumentando considerevolmente negli ultimi anni. Molti di loro soffrono di malattie croniche, problemi di salute mentale, dipendenze e necessitano di cure mediche complesse. Il loro stato di salute è spesso esacerbato per maggiori difficoltà nell'accesso alle cure primarie rispetto alla popolazione generale.

Materiali e Metodi. È stato distribuito un questionario autosomministrato al fine di valutare le condizioni di salute dei senzatetto che vivono a Palermo. È stato utilizzato un modello di regressione logistica multivariata calcolando gli Odds Ratios aggiustati (aOR).

Risultati. Il campione è costituito da 52 senzatetto, di cui 35 (67,3%) maschi. La classe di età più rappresentativa (55,8%) ha un'età inferiore a 50 anni e l'88,5% è italiano. L'analisi ha mostrato che il sesso femminile è significativamente associato a: "non svolgere attività fisica regolare" (aOR 4.14, IC 95% 1,20 - 14,32, p=0,025), ad "avere malattie croniche" (aOR 3,52, IC 95% 1,02 - 12,11, p=0,046)

e “ad assumere farmaci” (aOR 3,95, IC 95% 1,14 - 13,64, p=0,030). **Conclusioni.** La rilevanza e la complessità della situazione sociale dei senzatetto attira l’attenzione su questo fenomeno destinato ad avere un forte impatto sulle politiche e sui servizi sanitari. Questa fragile popolazione è esposta a malattie che sono in gran parte prevenibili o curabili attraverso un ampio e precoce accesso alle cure con conseguente riduzione del peggioramento degli esiti clinici e dei relativi costi sociali.

References

1. Ethos – Classificazione Europea sulla grave esclusione abitativa e la condizione di persona senza dimora. Available from: http://www.feantsa.org/download/it___894_2556517175588858.pdf [Last accessed 2018, Apr 11].
2. Llerena K, Gabrielian S, Green MF. Clinical and cognitive correlates of unsheltered status in homeless persons with psychotic disorders. *Schizophr Res* 2018 Feb 24. pii: S0920-9964-(18)30100-2. doi: 10.1016/j.schres.2018.02.023. PubMed PMID: 29486957.
3. Paiva IK, Lira CD, Justino JM, Miranda MG, Saraiva AK. Homeless people’s right to health: reflections on the problems and components. *Cien Saude Colet* 2016; **21**(8): 2595-606. doi: 10.1590/1413-81232015218.06892015. Review. English, Portuguese. PubMed PMID: 27557032.
4. Neisler J, Reitzel LR, Garey L, et al. Concurrent nicotine and tobacco product use among homeless smokers and associations with cigarette dependence and other factors related to quitting. *Drug Alcohol Depend* 2018; **185**: 133-140. doi: 10.1016/j.drugalcdep.2017.12.012. PubMed PMID: 29448145.
5. Rae BE, Rees S. The perceptions of homeless people regarding their healthcare needs and experiences of receiving health care. *J Adv Nurs* 2015; **71**(9): 2096-107. doi: 10.1111/jan.12675. Epub 2015 Apr 27. PubMed PMID: 25916241.
6. Global Homelessness Statistics. Available from: <https://homelessnessworldcup.org/homelessness-statistics/> [Last accessed 2018, Apr 11].
7. Istituto Nazionale di Statistica (ISTAT). The Homeless. Years 2014. Available from: https://www.istat.it/en/files/2016/06/EN_The-Homeless.pdf?title=The+homeless+-+3+Jun+2016+-+EN_The+Homeless.p [Last accessed 2018, Apr 11].
8. Harris T, Kintzle S, Wenzel S, Castro CA. Expanding the Understanding of Risk Behavior Associated With Homelessness Among Veterans. *Mil Med* 2017; **182**(9): e1900-e1907. doi: 10.7205/MILMED-D-16-00337. PubMed PMID: 28885953.
9. Homelessness e servizi per i senza fissa dimora in Italia e in Lombardia. Available from: <http://www.eupolis.regione.lombardia.it/shared/ccurl/252/411/homeless.pdf> [Last accessed 2018, Apr 11].
10. Fazel S, Geddes JR, Kushel M. The health of homeless people in high-income countries: descriptive epidemiology, health consequences, and clinical and policy recommendations. *Lancet* 2014; **384**(9953): 1529-40. doi: 10.1016/S0140-6736(14)61132-6. Review. PubMed PMID: 25390578; PubMed Central PMCID: PMC4520328.
11. Kerker BD, Bainbridge J, Kennedy J, et al. A population-based assessment of the health of homeless families in New York City, 2001-2003. *Am J Public Health* 2011; **101**(3): 546-53. doi: 10.2105/AJPH.2010.193102. Epub 2011 Jan 13. PubMed PMID: 21233439; PubMed Central PMCID: PMC3036697.
12. Baggett TP, Hwang SW, O’Connell JJ, et al. Mortality among homeless adults in Boston: shifts in causes of death over a 15-year period. *JAMA Intern Med* 2013; **173**(3): 189-95. doi: 10.1001/jamainternmed.2013.1604. PubMed PMID: 23318302; PubMed Central PMCID: PMC3713619.
13. Lebrun-Harris LA, Baggett TP, Jenkins DM, et al. Health status and health care experiences among homeless patients in federally supported health centers: findings from the 2009 patient survey. *Health Serv Res* 2013; **48**(3): 992-1017. doi: 10.1111/1475-6773.12009. Epub 2012 Nov 7. PubMed PMID: 23134588; PubMed Central PMCID: PMC3681240.
14. Nielsen SF, Hjorthøj CR, Erlangsen A, Nordentoft M. Psychiatric disorders and mortality among people in homeless shelters in Denmark: a nationwide register-based cohort study. *Lancet* 2011; **377**(9784): 2205-14. doi: 10.1016/S0140-6736(11)60747-2. Epub 2011 Jun 14. PubMed PMID: 21676456.
15. Health Quality Ontario. Interventions to Improve Access to Primary Care for People Who Are Homeless: A Systematic Review. *Ont Health Technol Assess Ser* 2016; **16**(9): 1-50. eCollection 2016. Review. PubMed PMID: 27099645; PubMed Central PMCID: PMC4832090.

16. McGuire J, Gelberg L, Blue-Howells J, Rosenheck RA. Access to primary care for homeless veterans with serious mental illness or substance abuse: a follow-up evaluation of co-located primary care and homeless social services. *Adm Policy Ment Health* 2009; **36**(4): 255-64. doi: 10.1007/s10488-009-0210-6. Epub 2009 Mar 12. PubMed PMID: 19280333.
17. Hwang SW, Chambers C, Chiu S, et al. A comprehensive assessment of health care utilization among homeless adults under a system of universal health insurance. *Am J Public Health* 2013; **103**(Suppl 2): S294-301. doi: 10.2105/AJPH.2013.301369. Epub 2013 Oct 22. PubMed PMID: 24148051; PubMed Central PMCID: PMC3969141.
18. Hwang SW, Ueng JJ, Chiu S, et al. Universal health insurance and health care access for homeless persons. *Am J Public Health* 2010; **100**(8): 1454-61. doi: 10.2105/AJPH.2009.182022. Epub 2010 Jun 17. PubMed PMID: 20558789; PubMed Central PMCID: PMC2901287.
19. Firenze A, Provenzano S, Santangelo OE, Alagna E, Piazza D, Torregrossa MV. Hackathon Public Health Clin Ter 2017; **168**(6): e421-e427. doi: 10.7417/T.2017.2045. PubMed PMID: 29209692.
20. Bush K, Kivlahan DR, McDonell MB, Fihn SD, Bradley KA. The AUDIT alcohol consumption questions (AUDIT-C): an effective brief screening test for problem drinking. Ambulatory Care Quality Improvement Project (ACQUIP). Alcohol Use Disorders Identification Test Arch Intern Med 1998; **158**(16): 1789-95.
21. Santangelo OE, Provenzano S, Piazza D, Firenze A. Factors associated at risky consumption of alcohol in a sample of University students. *Ann Ig* 2018; **30**(6): 502-8.
22. Ministero della Salute. Repubblica Italiana. Indice di massa corporea - IMC, come calcolarlo. Available from: http://www.salute.gov.it/portale/salute/p1_5.jsp?lingua=italiano&id=135&area=Vivi_sano [Last accessed 2018, Apr 11].
23. StataCorp 2015. Stata Statistical Software. Release 14. College Station, TX: StataCorp LP.
24. Mackenbach JP, Kulhánová I, Artnik B, et al. Changes in mortality inequalities over two decades: register based study of European countries. *BMJ* 2016; **353**: i1732. doi: 10.1136/bmj.i1732. PubMed PMID: 27067249; PubMed Central PMCID: PMC4827355.
25. Da Costa FA, Teixeira I, Duarte-Ramos F, et al. Effects of economic recession on elderly patients' perceptions of access to health care and medicines in Portugal. *Int J Clin Pharm* 2017; **39**(1): 104-112. doi: 10.1007/s11096-016-0405-3. Epub 2016 Dec 9. PubMed PMID: 27933488.
26. Suhrcke M, Stuckler D, Suk JE, et al. The impact of economic crises on communicable disease transmission and control: a systematic review of the evidence. *PLoS One* 2011; **6**(6): e20724. doi: 10.1371/journal.pone.0020724. Epub 2011 Jun 10. Review. PubMed PMID: 21695209; PubMed Central PMCID: PMC3112201.
27. Giordano D, Provenzano S, Santangelo OE, et al. Active immunization status against measles, mumps, rubella, hepatitis b in internationally adopted children, surveyed at the university hospital of Palermo, Sicily. *Ann Ig* 2018; **30**(5): 431-5.
28. World Health Organization (WHO). Risk factors for severe outcomes following 2009 Influenza A (H1N1) infection: A Global Pooled Analysis. Available from: http://www.who.int/influenza/surveillance_monitoring/Risk_factors_H1N1.pdf [Last accessed 2018, Apr 11].
29. Ministero della Salute. Repubblica Italiana. Piano Nazionale Prevenzione Vaccinale PNPV 2017-2019. Available from: http://www.salute.gov.it/imgs/C_17_pubblicazioni_2571_allegato.pdf [Last accessed 2018, Apr 11].
30. Kaushal K. Social desirability bias in face to face interviews. *J Postgrad Med* 2014; **60**(4): 415-6. doi: 10.4103/0022-3859.143989. PubMed PMID: 25370559.
31. Kypri K, Wilson A, Attia J, Sheeran P, Miller P, McCambridge J. Social Desirability Bias in the Reporting of Alcohol Consumption: A Randomized Trial. *J Stud Alcohol Drugs* 2016; **77**(3): 526-31. PubMed PMID: 27172587.
32. Sheikh MA, Abelsen B, Olsen JA. Differential Recall Bias, Intermediate Confounding, and Mediation Analysis in Life Course Epidemiology: An Analytic Framework with Empirical Example. *Front Psychol* 2016; **7**: 1828. eCollection 2016. PubMed PMID: 27933010; PubMed Central PMCID: PMC5120115.
33. Costa G, Bassi M, Gensini G, Marra M, Nicelli A, Zengarini N. L'equità nella salute in Italia. Secondo rapporto sulle disuguaglianze sociali in sanità. Milano: Franco Angeli, 2014.