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Searching for an alliance with journalism: a survey to investigate health literacy in Italy

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Abstract

Objectives. This study (GLASS) aimed to explore low health literacy (HL) prevalence among journalists and general population and factors associated with low HL.

Methods. GLASS was an Italian online cross-sectional study. Questionnaires included instruments for different HL dimensions: single item literacy screener (SILS), medical term recognition test (METER), medical data interpretation test (MDIT). For each instrument, multiple regressions were performed.

Results. Participants were 665. A total of 24.6%, 85.0%, and 58.9% journalists and 19.5%, 77.8%, and 62.6% general population reported low HL (SILS, METER, MDIT, respectively). Regressions showed that journalists who had never written about health and journalists who had personally written about health without being health journalists had a higher likelihood of low HL compared with health journalists.

Conclusion. Since journalists are key players in public health, our findings are relevant; especially considering the context of the current pandemic. It would be advisable to bolster a stronger collaboration between professionals in the media world and the scientific community.

Key words

- health literacy
- journalism
- health communication

INTRODUCTION

Health literacy (HL) is defined by the World Health Organization (WHO) as a combination of skills every human being needs to "access, understand, appraise and apply health information, to make judgements and take decisions in everyday life" for protecting and maintaining health [1]. Despite being the result of multiple social and individual factors [2], HL can be described using (at least) three progressively higher levels of individual autonomy and personal empowerment: functional, interactive and critical HL [3].

Quantification of HL [4] has been crucial to determine its effect on health-related outcomes. Since its first debut in 1974 [5], it is now clear that a low HL level is associated with more hospitalizations, greater use of emergency care, low receipt of health prevention initiatives such as screenings (i.e., mammography) and influenza vaccine, and also poorer ability in taking medications correctly or to interpret labels and health messages [6], possibly undermining efforts in developing patient empowerment.

Low HL level has been recognized to play an essential role in the context of health information seeking and quality assessment using both classic and new media [7]. In this regard, the quality of information is crucial, and in 2006 health journalism accepted the challenge with Health News Review organization developing a set of 10 rigorous criteria that "all health care news stories and all health care news (press) releases about interventions should include" [8, 9]. It was found that the stories considered during 2005-2010 successfully met just less than half of the criteria, particularly in terms of "spinning" research results (magnification of findings and picturing a new treatment a major breakthrough) and failing to discuss costs and quality of evidence of drugs or health [10, 11].

Although a direct effect of media coverage on HL is unclear [12], evidence that an inaccurate coverage could influence health choices is well [13, 14], and possibly exacerbated during critical times such as a pandemic, with the development of the so-called infodemic, defined as "too much information including false or misleading information in digital and physical environments during a disease outbreak" [15].

Focusing on the Italian context, the legislation does not provide a defined path to become a health journalist. Moreover, registered journalists do not need to specialize in a certain field, although it naturally occurs among

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editorial staff of the most widely circulating newspaper and TV newsrooms. The same does not always apply to small magazines and newspaper staff or among relatively new online journal realities, where medical and health-related news can be covered by journalists with a broad range of backgrounds [16].

Therefore, given the role of a low HL in conditioning health outcomes and the importance of quality in health journalism to provide an accurate coverage of health information, our primary aim was to assess the prevalence of low HL among Italian general population and, especially, among journalists to explore if journalists operating in the health field had the proper skills to correctly interpret health communication and adequately convey it to the reader. Additionally, we aimed to investigate factors potentially associated with low HL both in general population and journalists.

METHODS

Study design

The GLASS (Livello di Alfabetizzazione su Salute e Sanità nei Giornalisti, i.e., health literacy level among journalists) study was a cross-sectional survey conducted in Italy amongst a convenience sample of adults. The study was approved by the Internal Review Board of the Department of Public Health Sciences of the University of Turin. Criteria for the inclusion in the study were: age ≥18 years old; being resident in Italy and being able to give informed consent.

The research was conducted using the computer-assisted web interview (CAWI) method. The survey was developed using the Uniquest (Limesurvey) platform. The survey consisted of a questionnaire distributed mainly on Facebook through a web link shared by institutional social media pages and personal accounts of researchers. The survey was spread from June to September 2019. Before starting the survey, a brief explanation of the study was shown to each participant. Then, by confirming the enrolment to the study, each participant declared their informed consent. Participation was voluntary and anonymous, and participants received no compensation.

Instruments

For each participant, the first section of the questionnaire consisted of ten questions investigating the socio-demographic and health-related characteristics, e.g., age, gender, education, perceived economic status and presence of a personal chronic disease/disability. Participants were asked if their work/study background was in healthcare, journalism or other. Journalists were asked four additional questions to frame their professional activity.

The next section was dedicated to HL: as recommended for robust research methods in HL measurements [17], we included multiple measures. We used: the single item literacy screener (SILS) [18], the medical term recognition test (METER) [19] and the medical data interpretation test (MDIT) [20].

The SILS is a single question which has shown high reliability and validity [18]. It asks "How often do you need to have someone help you when you read instructions, pamphlets, or other written material from your doctor or pharmacy?" and 4 answers are possible, with a score of 2 set as cut-off [18]. It was used in its validated Italian version [21]. Scores greater than 2 help identifying individuals at higher risk of limited reading and understanding ability regarding health information [18, 21]. It is considered a self-reported comprehension tool to investigate HL [22].

The METER is another measurement with high reliability and validity [19], which was used in its Italian validated version [23]. It consists of a list of 70 terms that are both real medical terms (40 items) and words that sound alike but are not real words (30 items). The participants are asked to check off those words they recognize as actual medical terms. The score is defined as the sum of correct words recognized and the cut-off points have been set as 0-20 for low, 21-34 for marginal and 35-40 for functional HL levels [19]. It is considered a word recognition tool to assess HL [22].

The MDIT is a reading/numeracy comprehension tool, which is focused on skills to understand and compare medical statistics about disease risk and about risk reduction and can be an assessment of abilities for making sense of ordinary health information [20]. It was used the Italian short version, which consists of 10 items [24]. The percentage of correct answers represents the final score: a 0-100 scale with higher scores indicating greater abilities in interpreting information [20]. A score ≥75 can be considered as "passing" HL [25].

Statistical analysis

This paper had three outcomes: having a "low HL" according to the above-mentioned tools (SILS: score >2 [18]; METER: score <35 [19]; MDIT: score <75 [25]).

In this paper, we were primarily interested in studying the general population, specifically focusing on journalists. The target groups were: "health journalists" (journalists whose primary area of specialization is medicine/health); journalists who had personally written about medicine/health/public health in their career but whose primary area is not medicine/health (i.e., non-health journalists who have personally written about medicine); journalists who had never written about medicine/health/public health in their career; general population (excluding journalists). Additionally, we collected data on people working/studying in the healthcare field. We considered the whole sample for descriptive analyses and different subsamples in the regression analyses as explained below.

Descriptive analyses were performed. Continuous variables were expressed as median and interquartile range (IQR) since the Shapiro-Wilk test showed non-normal distributions. Chi-squared tests (Kruskal-Wallis or Mann-Whitney U tests for continuous variables) were computed to assess differences between: groups defined by the work/study background; groups defined by the outcomes. Relationships between outcomes were explored by chi-squared statistics and Cohen's kappa coefficient.

For each outcome, simple logistic regressions were conducted with the target groups as covariate. The effects of the independent variables on the outcomes

were analyzed with multiple logistic regressions adjusted for age and gender. Final models were achieved with a backward stepwise method (results expressed as odds ratios OR, 95% CI). Specifically, the default option of the SPSS software for backward elimination was used (likelihood-ratio statistic greater than 0.10 as removal criterion). In the *Supplementary material*, a list of the variables that were entered at the first step is shown *(Supplementary Methods M1 available online)*. For each outcome, the models were executed in different subsamples: general population (including journalists); journalists (also entering the variables specifically collected for this subgroup); participants with a healthcare background. We decided to keep "healthcare people" separated from the others as they may report different variables influencing HL due to their background.

SPSS software (version 26) was used, and a two-tailed p-value <0.05 was considered to be statistically significant. Missing values were excluded.

RESULTS

Characteristics of the sample

The sample consisted of 665 participants. Females accounted for 66.5%. The median age was 37 years (IQR = 30-49). The majority had an educational level higher than the high school diploma (68.1%). A total of 82.6% were workers.

Stratifying the sample by work/study background, some significant differences were revealed. For instance, participants with journalism background were less likely to have a Bachelor or Master's degree (p <0.001), be a student or non-worker (p <0.001), and have a good/excellent perceived economic status (p = 0.025). Details are in *Table 1*.

Additional information was collected for participants with a journalism background. The majority consisted of journalists working for a daily newspaper (38.7%), followed by freelance journalists (20.4%), journalists working for periodical (19.7%) and for online magazine (19.7%) (chance to select more than one option). The most frequent primary areas of specialization were: politics (35.9%), news report (32.4%), education (28.2%), and medicine/health (25.4%) (chance to select more than one option). A total of 64.8% declared to have personally written about medicine/health and 31.7% stated to have studied health communication or scientific dissemination through a course or other means. Thus, 25.4% reported medicine/health as the primary area (n = 36), 39.4% reported to have written about medicine/health but medicine/health was not their primary area (n = 56), and 35.2% neither reported medicine/health as the primary area nor declared to have written about medicine/health (n = 50). Details are presented in *Table S1 (Supplementary material available online)*.

Description of the outcomes

A total of 115 participants (17.3%) reported an inadequate HL according to the SILS (median score 2, IQR = 1-2). According to the METER, 438 participants (68.4%) reported low (n = 69) or marginal (n = 369) levels of HL, while 202 reported functional levels of HL (31.6%) (median score 32, IQR = 27-35). Based on the MDIT, 322 individuals (59.2%) reported a non-passing HL against 222 individuals (40.8%) with a passing HL (median score 70%, IQR = 60-80%). The categories of low HL defined by the different outcomes were associated each other *(Table 2)*. However, the Cohen's kappa coefficient indicated poor concordance (METER *vs* SILS: 0.106; MDIT *vs* SILS: 0.100; METER *vs* MDIT: 0.125).

The prevalence of low HL was different between the categories of work/study background (SILS: p <0.001, METER: p <0.001, MDIT: p = 0.096). A total of 24.6% (SILS), 85.0% (METER), and 58.9% (MDIT) journalists reported low HL. Among participants neither with journalism nor with healthcare background, the prevalence of low HL was 19.5% (SILS), 77.8% (METER), and 62.6% (MDIT). Participants with healthcare background had reduced frequencies of low HL *(Table 2)*. It must be noted that for the METER the above-mentioned results for "low HL" refer to low and marginal levels. Considering only actual low HL, such percentages are: 21.4% for journalists, 9.7% for general population, 3.4% for healthcare participants.

Both considering METER and MDIT, the prevalence of low HL showed a significant decreasing frequency with the increase of education level. The distribution of age was not different across the categories defined by the outcomes (SILS p = 0.651, METER p = 0.531, MDIT p = 0.082). The prevalence of poor HL was lower among those with a perceived good/excellent economic status (SILS, MDIT), among those with a chronic disease/disability (METER), and among those with a family member working in the healthcare field (METER). Participants with a family member working in the healthcare field showed a higher prevalence of inadequate HL according to SILS. Other details are in *Table 2*.

Considering additional journalists' information, there was no significant differences according to the SILS. Both for METER and MDIT, health journalists were less likely to report low HL (METER: 69.4%, MDIT: 26.7%), while non-health journalists who had personally written about medicine/health (METER: 87.5%, MDIT: 68.6%) and journalists who had never written about medicine/health (METER: 93.8%, MDIT: 69.8%) showed a greater prevalence of low HL (METER: p <0.007, MDIT: p <0.001). It must be noted that for the METER the above-mentioned results for "low HL" refer to low and marginal levels. Considering only actual low HL, such percentages are: 0% for health journalists, 19.6% for non-health journalists who had personally written about medicine/health, 39.6% for other journalists.

Moreover, journalists writing for online magazine (METER: p = 0.018), journalists writing for daily newspapers (MDIT: p = 0.012), and journalists whose primary area was technology and computer science (MDIT: p = 0.017) reported lower frequencies of poor HL. Journalists whose primary area was sports/motor sports (MDIT: p <0.001) or entertainment (MDIT: p = 0.024) reported higher prevalence of low HL. Having studied health communication or scientific dissemination through a course or other means showed no significant association with HL. Details are in *Table S1 (Supplementary material available online)*.

Table 1
Characteristics of the sample: overall descriptive analyses and stratified by work/study background

Characteristic	Overall sample (n = 665) N (%)	Journalism background (n = 142) N (%)	Healthcare background (n =158) N (%)	Neither journalism nor healthcare background (n = 365) N (%)	p-value
Age*	37 (30-49)	40 (33-52)	34 (28-45)	38 (30-48)	**0.001**
Gender					
Male	222 (33.5)	80 (56.7)	43 (27.2)	99 (27.3)	**<0.001**
Female	440 (66.5)	61 (43.3)	115 (72.8)	264 (72.7)	
Nationality					
Italian	659 (99.1)	142 (100)	158 (100)	359 (98.4)	0.083
Other	6 (0.9)	0 (0)	0 (0)	6 (1.6)	
Area					
Northern Italy	544 (81.8)	88 (62)	131 (82.9)	325 (89)	**<0.001**
Central Italy	60 (9)	27 (19)	15 (9.5)	18 (4.9)	
Southern Italy	61 (9.2)	27 (19)	12 (7.6)	22 (6)	
Education level					
High school or lower	212 (31.9)	46 (32.4)	29 (18.4)	137 (37.5)	**<0.001**
Bachelor or Master's degree	327 (49.2)	59 (41.5)	82 (51.9)	186 (51)	
Postgraduates degree	126 (18.9)	37 (26.1)	47 (29.7)	42 (11.5)	
Household					
1 person	111 (16.7)	30 (21.1)	21 (13.3)	60 (16.4)	0.329
2 persons	169 (25.4)	39 (27.5)	39 (24.7)	91 (24.9)	
More than 2 persons	385 (57.9)	73 (51.4)	98 (62)	214 (58.6)	
Occupation					
Worker	537 (82.6)	135 (95.7)	119 (78.3)	283 (79.3)	**<0.001**
Non-worker (homemaker, retiree, unemployed)	52 (8)	3 (2.1)	7 (4.6)	42 (11.8)	
Student	61 (9.4)	3 (2.1)	26 (17.1)	32 (9)	
Perceived economic status					
Good/excellent	433 (65.1)	80 (56.3)	101 (63.9)	252 (69)	**0.025**
Insufficient/poor	232 (34.9)	62 (43.7)	57 (36.1)	113 (31)	
Personal chronic disease or disability					
No	548 (82.5)	125 (88.7)	126 (79.7)	297 (81.4)	0.088
Yes	116 (17.5)	16 (11.3)	32 (20.3)	68 (18.6)	
Family member with a chronic disease or disability					
No	393 (59.2)	93 (66)	83 (52.5)	217 (59.5)	0.061
Yes	271 (40.8)	48 (34)	75 (47.5)	148 (40.5)	
Family member working in the healthcare field					
No	440 (66.3)	100 (70.9)	81 (51.3)	259 (71)	**<0.001**
Yes	224 (33.7)	41 (29.1)	77 (48.7)	106 (29)	

n = sample size. Figures are expressed as number (N) and column percentages (%). P-value obtained via chi-squared tests. *Figures expressed as median (interquartile range).

Regression models

Table S2 shows simple regressions for each outcome with the target groups as independent variable *(Supplementary material available online)*. No group reported a significant association with low HL defined by the SILS. Concerning both the METER and the MDIT, non-health journalists who had personally written about medicine/health and journalists who had never written

Table 2
Descriptive analyses stratified by the health literacy outcomes

	SILS: inadequate HL			METER: low/marginal HL			MDIT: non-passing HL		
	No (n = 550) N %	Yes (n = 115) N %	p	No (n = 202) N %	Yes (n = 438) N %	p	No (n = 222) N %	Yes (n = 322) N %	p
METER: low/marginal HL									
No	187 (92.6)	15 (7.4)	**<0.001**	-			-		
Yes	339 (77.4)	99 (22.6)							
MDIT: non-passing HL									
No	201 (90.5)	21 (9.5)	**<0.001**	84 (37.8)	138 (62.2)	**0.003**	-		
Yes	254 (78.9)	68 (21.1)		83 (25.8)	239 (74.2)				
Work/study background									
Journalism	107 (75.4)	35 (24.6)	**<0.001**	21 (15)	119 (85)	**<0.001**	51 (41.1)	73 (58.9)	0.096
Healthcare	149 (94.3)	9 (5.7)		103 (69.6)	45 (30.4)		60 (48.8)	63 (51.2)	
Neither journalism nor healthcare	294 (80.5)	71 (19.5)		78 (22.2)	274 (77.8)		111 (37.4)	186 (62.6)	
Gender									
Male	186 (83.8)	36 (16.2)	0.627	65 (30)	152 (70)	0.532	87 (47)	98 (53)	**0.035**
Female	362 (82.3)	78 (17.7)		136 (32.4)	284 (67.6)		134 (37.6)	222 (62.4)	
Nationality									
Italian	546 (82.9)	113 (17.1)	0.297	202 (31.9)	432 (68.1)	0.095	220 (40.7)	320 (59.3)	0.707
Other	4 (66.7)	2 (33.3)		0 (0)	6 (100)		2 (50)	2 (50)	
Area									
Northern Italy	456 (83.8)	88 (16.2)	0.060	173 (33)	351 (67)	0.092	187 (42.5)	253 (57.5)	0.214
Central Italy	43 (71.7)	17 (28.3)		18 (31)	40 (69)		19 (36.5)	33 (63.5)	
Southern Italy	51 (83.6)	10 (16.4)		11 (19)	47 (81)		16 (30.8)	36 (69.2)	
Education level									
High school or lower	167 (78.8)	45 (21.2)	0.147	46 (22.7)	157 (77.3)	**0.004**	47 (27)	127 (73)	**<0.001**
Bachelor or Master's degree	274 (83.8)	53 (16.2)		111 (35.1)	205 (64.9)		123 (46.4)	142 (53.6)	
Postgraduates degree	109 (86.5)	17 (13.5)		45 (37.2)	76 (62.8)		52 (49.5)	53 (50.5)	
Household									
1 person	94 (84.7)	17 (15.3)	0.833	25 (23.8)	80 (76.2)	0.124	41 (47.7)	45 (52.3)	0.214
2 persons	139 (82.2)	30 (17.8)		59 (35.5)	107 (64.5)		62 (43.1)	82 (56.9)	
More than 2 persons	317 (82.3)	68 (17.7)		118 (32)	251 (68)		119 (37.9)	195 (62.1)	
Occupation									
Worker	448 (83.4)	89 (16.6)	0.930	157 (30.1)	364 (69.9)	0.081	189 (41.6)	265 (58.4)	0.057
Non-worker (homemaker, retiree, unemployed)	44 (84.6)	8 (15.4)		20 (40.8)	29 (59.2)		9 (23.7)	29 (76.3)	
Student	50 (82)	11 (18)		23 (41.8)	32 (58.2)		19 (48.7)	20 (51.3)	
Perceived economic status									
Good/excellent	369 (85.2)	64 (14.8)	**0.019**	141 (34.1)	273 (65.9)	0.066	156 (44.1)	198 (55.9)	**0.035**
Insufficient/poor	181 (78)	51 (22)		61 (27)	165 (73)		66 (34.7)	124 (65.3)	
Personal chronic disease or disability									
No	450 (82.1)	98 (17.9)	0.289	154 (29.3)	372 (70.7)	**0.008**	187 (42.1)	257 (57.9)	0.191
Yes	100 (86.2)	16 (13.8)		48 (42.1)	66 (57.9)		35 (35)	65 (65)	
Family member with a chronic disease or disability									
No	324 (82.4)	69 (17.6)	0.749	110 (29.2)	267 (70.8)	0.120	137 (42.4)	186 (57.6)	0.357
Yes	226 (83.4)	45 (16.6)		92 (35)	171 (65)		85 (38.5)	136 (61.5)	
Family member working in the healthcare field									
No	374 (85)	66 (15)	**0.038**	119 (28.3)	302 (71.7)	**0.013**	145 (40.2)	216 (59.8)	0.668
Yes	176 (78.6)	48 (21.4)		83 (37.9)	136 (62.1)		77 (42.1)	106 (57.9)	

n = sample size. Figures are expressed as number (N) and row percentages (%). P-value obtained via chi-squared tests y.
HL: health literacy (HL). MDIT: medical data interpretation test; METER: medical term recognition test; SILS: single item literacy screener.

about medicine/health were more likely to have low HL. General population had a higher likelihood of reporting a low HL defined by the MDIT.

The multiple regression model confirmed no significant differences in HL defined by the SILS between the target groups. Participants from Central Italy and people with a family member working in the healthcare field were more likely to report a low SILS HL. Increasing age was associated with a lower likelihood of poor HL. The model considering only the journalists' subsample confirmed the relationship with age *(Table 3)*.

The METER multiple regression model revealed that, in addition to the relationships highlighted in the simple regression *(Supplementary material, Table S2, available online)*, also general population had a higher likelihood of reporting low HL compared with health journalists. Specifically, general population seemed to have a risk lower than the one of non-health journalists who had personally written about medicine/health and journalists who had never written about medicine/health; however, the 95% CIs were overlapped. Participants with a high school diploma or lower education level showed a higher likelihood too. Non-workers had a lower probability of reporting low HL compared with workers. The model considering only the journalists showed that an increasing age was associated with a higher likelihood of low HL and journalists whose primary area was politics or science and medicine had a lower probability of poor HL *(Table 3)*.

The MDIT multiple regression model confirmed non-health journalists who had personally written about medicine/health and journalists who had never written about medicine/health were more likely to have low HL, while this relationship was not confirmed for general population. Participants with a high school diploma or lower education level and females also showed a higher likelihood of low HL. Increasing age seemed to slightly reduce the odds of low HL. Additionally, the model considering only the journalists' subsample showed journalists working for daily newspaper were less likely to report poor HL *(Table 3)*.

Lastly, multiple regression models were performed in the healthcare subsample. Both for the SILS and the METER models, increasing age reduced the odds of poor HL (SILS: OR 0.92, 95% CI 0.87-0.97, p = 0.004; METER: OR 0.96, 95% CI 0.94-0.98, p <0.001). Students were less likely to report low HL defined by the METER (OR 0.19; 95% CI 0.04-0.88, p = 0.034). Concerning the MDIT, participants with an insufficient/poor perceived economic situation had a greater likelihood of low HL (OR 2.75, 95% CI 1.16-6.56, p = 0.022) *(Supplementary material, Table S3, available online)*.

DISCUSSION

This study aimed to estimate the prevalence of low HL among journalists and general population and to explore the factors potentially associated with low HL.

Concerning self-reported comprehension (i.e., SILS), a meta-analysis found a prevalence of low HL of 42% (95% CI 36-48%) in Europe and 42% (95% CI 33-51%) in Italy [22]. Compared with such pooled prevalence, in our sample the low HL defined by the SILS was found to be less frequent, especially among healthcare professionals (5.7%), health journalists (13.9%) and general population (19.5%). Interestingly, both journalists who have never written about medicine/health and non-health journalists who have personally written about medicine/health reported the greatest levels of "self-reported" low HL (28% and 28.6%, respectively).

About word recognition items, the prevalence in Europe was found to be 27% (95% CI: 18-38%) and in Italy 38% (95% CI: 35-41%) [22]. In our sample there were lower percentages of people with low HL in word recognitions items, except for journalists who have never written about medicine/health (39.6%) and non-health journalists who have personally written about medicine/health (19.6%). Adding participants with marginal HL, the percentages of people with non-functional HL are remarkably high, from 30.4% of "healthcare" participants to 69.4% of health journalists, 77.8% of general population, 87.5% of non-health journalists who have personally written about medicine/health and 93.8% of journalists who have never written about medicine/health.

Last, regarding reading/numeracy comprehension items, our results are in line with the dramatically high levels of low HL found in Italy by Baccolini, *et al*. [22]. Indeed, in Europe this kind of low HL was found to be 42% (95% CI: 33-53%), while in Italy 72% (95% CI: 32-93%). We found percentages between 62% and 70% for general population and non-health journalists (also those who have personally written about medicine/health). Interestingly, in this case the lowest percentages were reported by health journalists (26.7%) and not by the "healthcare" participants (51.2%). This could be partially due to the fact that the category "healthcare" can include a wide range of professionals and their knowledge may vary especially when considering reading/numeracy comprehension. Indeed, we found significant associations between higher levels of HL and "healthcare" participants both for SILS and METER, while we did not find any significant association for MDIT.

Therefore, in our study, the greatest levels of low HL in all the studied dimensions were reported by journalists who have never written about medicine/health and journalists who have personally written about medicine/health without being health journalists. These findings are confirmed in the multiple regression models, where the above-mentioned subgroups had a significantly higher likelihood of reporting low HL both for METER and for MDIT. Since also journalists that have no specific expertise in medicine may write about it, these findings are alarming as journalists are widely recognized to be a potential key player in public health and health-related initiatives [26-29]. Although it is difficult to find evidence about HL of journalists in scientific literature, some findings are in line with the low HL we found. Shah and colleagues outlined that the low HL rate of journalists was a major obstacle to accurate and comprehensive polio vaccine coverage in Pakistan [26]. Wilson *et al*. reported that most magazines with "health" in the tile showed poor quality and unreliable health advice [30]. Interestingly, Hinnant and col-

Table 3
Multiple regression models with poor health literacy as outcome (according to SILS, METER, and MDIT)

	SILS						METER						MDIT					
	Journalists and general population			Journalists			Journalists and general population			Journalists			Journalists and general population			Journalists		
	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p
Age	0.97	0.95-0.98	<0.001	0.95	0.92-0.98	<0.001	0.99	0.98-1.01	0.434	1.07	1.03-1.11	0.002	0.98	0.96-0.99	0.018	1.02	0.99-1.04	0.260
Female	1.17	0.71-1.9	0.541	0.86	0.37-2.01	0.734	1.08	0.67-1.74	0.754	1.05	0.34-3.21	0.930	1.56	1.01-2.42	0.047	0.34	0.14-0.83	0.018
Health journalists	Ref.						Ref.						Ref.					
Non-health journalists who had personally written about medicine/health	1.00	0.41-2.42	0.994				5.37	1.99-14.5	0.001				2.81	1.15-6.91	0.024			
Journalists who had never written about medicine/health	1.11	0.44-2.81	0.831				14.20	3.02-66.86	0.001				2.64	1.04-6.71	0.041			
General population	0.55	0.28-1.06	0.074				3.54	1.87-6.71	<0.001				1.89	0.96-3.73	0.066			
Nationality other than Italian	2.83	0.49-16.21	0.244										0.51	0.07-3.87	0.515			
Northern Italy	Ref.						Ref.			Ref.			Ref.					
Central Italy	2.11	1.05-4.26	0.036				1.81	0.71-4.67	0.217	4.56	0.88-23.54	0.070	1.27	0.6-2.7	0.536			
Southern Italy	0.52	0.22-1.27	0.153				*			*			1.43	0.63-3.21	0.392			
Bachelor or Master's degree	Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
High school or lower	0.93	0.56-1.55	0.786	1.74	0.62-4.88	0.291	1.76	1.02-3.02	0.043	0.25	0.05-1.3	0.100	2.29	1.4-3.76	0.001	2.24	0.71-7.08	0.170
Postgraduate degree	0.55	0.27-1.12	0.099	0.59	0.18-1.93	0.380	1.44	0.74-2.81	0.287	0.46	0.12-1.78	0.260	0.72	0.39-1.29	0.268	0.61	0.17-2.26	0.460
Insufficient/ poor economic situation	1.39	0.89-2.18	0.148				1.25	0.77-2.03	0.361							2.06	0.85-5	0.110
Family member with a chronic disease or disability	0.87	0.55-1.39	0.560							0.57	0.20-1.64	0.296				2.52	0.97-6.5	0.057
Family member working in the healthcare field	2.10	1.31-3.37	0.002				0.84	0.51-1.37	0.478									
Household: 1 person				Ref.									Ref.					
Household: 2 persons				2.41	0.67-8.64	0.177							0.92	0.49-1.72	0.784			
Household: More than 2 persons				3.14	0.96-10.3	0.059							1.11	0.63-1.96	0.728			
Worker							Ref.						Ref.					
Non-worker							0.35	0.16-0.75	0.007				2.13	0.83-5.42	0.114			
Student							2.08	0.59-7.33	0.255				0.64	0.24-1.71	0.371			
Personal chronic disease or disability							0.72	0.39-1.31	0.282	0.27	0.05-1.37	0.114	1.16	0.64-2.11	0.625	3.77	0.7-20.24	0.122
Primary area of specialization: education				2.12	0.86-5.25	0.104												

Continues

Table 3
Continued

	SILS						METER						MDIT					
	Journalists and general population			Journalists			Journalists and general population			Journalists			Journalists and general population			Journalists		
	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p	adjOR	95% CI	p
Primary area of specialization: science & medicine				0.30	0.08-1.12	0.073				0.25	0.06-0.99	0.049				0.22	0.06-0.87	0.030
Primary area of specialization: politics										0.19	0.05-0.75	0.018						
Primary area of specialization: news report										4.14	0.88-19.51	0.073						
Having personally written about medicine				0.86	0.35-2.14	0.745				1.36	0.36-5.08	0.651				0.93	0.33-2.61	0.896
Having studied health communication or scientific dissemination through a course or other means				2.31	0.73-7.3	0.155				1.29	0.32-5.32	0.721				2.71	0.7-10.48	0.149
Daily newspaper																0.32	0.12-0.86	0.024
Periodical																0.33	0.09-1.19	0.091

Figures are expressed as adjusted Odds Ratios (adjOR) and 95% Confidence Interval. *Southern Italy was omitted because of the small size (CI).
HL: health literacy (HL); MDIT: medical data interpretation test; METER: medical term recognition test; SILS: single item literacy screener.

leagues showed that health journalists view their primary responsibility to their audience as individuals and not as a public service to the society, thus highlighting that the way how journalists perceive their role may be an important field of additional studies [27]. Beyond HL and skills of journalists, it must be noted that, to achieve an improved health communication, it is also essential to promote a substantive public engagement of scientists [31] as stronger collaborations between scientists and journalists might help in improving public health outcomes [28].

Additionally, our findings seem even more alarming in the light of the COVID-19 pandemic. Indeed, it is possible that journalists that have never written about medicine and health-related topics have to write about pandemic-related information during the so-called infodemic [15]. False information is not necessarily designed with bad intentions and misinformation caused by a poor HL of journalists can be harmful: the coverage of health in the mass media and its quality is critical since it is the key source for information for the general population [32]. It also should be noted that, during the pandemic, trust towards journalists may be reduced [33], thus suggesting that increasing reliability for instance through the improvement of journalists' HL could be essential to reach the population with correct information.

Moreover, beyond the journalists' area of specialization, other factors were associated with low HL. Both for METER and MDIT, low education increased the likelihood of low HL consistently with other relevant works [34, 35]. Such relationship was not found for the SILS probably due to the nature of the instrument: even if a very short self-reported comprehension tool can be useful to quickly assess the HL status, subjective estimates of HL may have higher misclassification rates [36]. Similarly, the fact that participants with a family member working in the healthcare field had a higher likelihood of low HL according to the SILS could be due to the self-reported nature: those participants probably ask more for help since they have the chance to easily receive a professional answer. Concerning age, our results conflict with most of HL literature that shows older age is linked to low HL [22, 34, 35]. However, this could be partially explained by the quite young median age of our sample. Furthermore, according to the MDIT model, women had a higher likelihood of low HL in the general population sample while they had a lower likelihood in the journalists' subsample. Thus, also considering that other relevant works are conflicting about this issue [34, 35], the relationship with gender should be further explored to understand if some gender-related determinants can influence HL. Lastly, considering only the journalists' subsample, it is interesting that also journalists whose primary area of specialization was politics had a lower likelihood of low HL: this could be explained by the fact that politics journalists must comprehend health policies. More-

over, the possible reasons for the higher HL reported by journalists working in daily newspapers should be further investigated. It is worth noting that having studied health communication/scientific dissemination was not significant for any outcomes, perhaps because the experience gained working in the medicine-related field might be more important than attending courses.

Regarding the models for the healthcare subsample, observations like in the general population model can be done about age. Interestingly, students had a lower likelihood of low HL and this could be partially explained by the fact that, perhaps, students present a higher internet use, which has been found linked to high HL [34]. Last, participants with an insufficient/poor perceived economic situation had a greater likelihood of low HL consistently with findings about HL [35] (it must be noted that the healthcare subsample did not include only medical doctors but all possible workers/students within the healthcare field).

This work had some strengths and limitations. To our knowledge, it was one of the first studies examining the HL among different kind of journalists and it used only validated tools to measure HL [21, 23, 24]. It should be noted that the categories defined by the instruments were significantly associated, although with a poor concordance. This could be partially due to the fact that these tools do measure different dimensions of HL. Specifically, the use of multiple measures of HL, as we did, is recommended for robust research methods in HL [17]. The small sample represented the main limitation, along with the cross-sectional design and the convenience sampling. Besides, the generalizability of the results is also limited to the Italian context. However, this study offers a glimpse of the pre-COVID-19 situation among Italian mass media operators and it can be a starting point to investigate the HL among the journalists' category, which should be a public health priority due to the infodemic that is characterizing the current scenario.

In conclusion, health journalists and general population showed good levels of HL compared with non-health journalists, even though they have written about medicine/health during their career. These findings are remarkable, especially in the light of the current infodemic that is following the pandemic. The role of journalists in improving health communication and public health outcomes must be further investigated and it would be advisable to bolster a stronger collaboration between journalism and science.

Ethical approval

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Author's contribution

Conception and design: GLM, DC, GV, MRG, RC, FB, RS; data acquisition: GLM, DC, RC; analysis and interpretation of data: GLM, DC, GV, MRG, AS, RC; writing publication: GLM, DC, GV, AS; critical revision: GLM, DC, GV, MRG, FB, RS; supervision and final approval: MRG, FB, RS.

Conflict of interest statement

The Authors of this paper declare no conflict of interest.

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REFERENCES

1. World Health Organization, Regional Office for Europe. Health literacy: the solid facts. WHO; 2013. Available from: https://apps.who.int/iris/handle/10665/326432.
2. Yip MP. A health literacy model for limited English speaking populations: Sources, context, process, and outcomes. Contemp Nurse. 2012;40:160-8. doi: https://doi.org/10.5172/conu.2012.40.2.160
3. Nutbeam D. Health literacy as a public health goal: A challenge for contemporary health education and communication strategies into the 21st century. Health Promot Int. 2000;15:259-67. doi: https://doi.org/10.1093/heapro/15.3.259
4. Ian CY, Xu RH, Mo PKH, Dong D, Wong ELY. Generic health literacy measurements for adults: A scoping review. Int J Environ Res Public Health. 2020;17:1-18. doi: https://doi.org/10.3390/ijerph17217768
5. Simonds SK. Health education as social policy. Health Educ Monogr. 1974;2:1-10. https://doi.org/10.1177/10901981740020S102
6. Berkman ND, Sheridan SL, Donahue KE, Halpern DJ, Crotty K. Low health literacy and health outcomes: An updated systematic review. Ann Intern Med. 2011;155:97-107. doi: https://doi.org/10.7326/0003-4819-155-2-201107190-00005
7. Diviani N, Van Den Putte B, Giani S, Van Weert JCM. Low health literacy and evaluation of online health information: A systematic review of the literature. J Med Internet Res. 2015;17:1-17. doi: https://doi.org/10.2196/jmir.4018
8. HealthNewsReview.org. Improving your critical thinking about healthcare 2006. Available from: www.healthnewsreview.org/about-us/review-criteria/.
9. Oransky I. Will improvements in health journalism improve health literacy? Stud Health Technol Inform. 2020;269:511-25. doi: https://doi.org/10.3233/SHTI200059
10. Schwitzer G. How do US journalists cover treatments, tests, products, and procedures? An evaluation of 500 stories. PloS Med. 2008;5:0700-4. doi: https://doi.org/10.1371/journal.pmed.0050095
11. Walsh-Childers K, Braddock J, Rabaza C, Schwitzer G. One step forward, one step back: Changes in news coverage of medical interventions. Health Commun. 2018;33:174-87. doi: https://doi.org/10.1080/10410236.2016.1250706

12. Grilli R, Ramsay C, Minozzi S. Mass media interventions: effects on health services utilisation. Cochrane Database Syst Rev. 2002. doi: https://doi.org/10.1002/14651858.cd000389
13. Mason BW, Donnelly PD. Impact of a local newspaper campaign on the uptake of the measles mumps and rubella vaccine. J Epidemiol Community Health. 2000;54:473-4. doi: https://doi.org/10.1136/jech.54.6.473
14. Codish S, Novack L, Dreiher J, Barski L, Jotkowitz A, Zeller L, et al. Impact of mass media on public behavior and physicians: An ecological study of the H1N1 influenza pandemic. Infect Control Hosp Epidemiol. 2014;35:709-16. doi: https://doi.org/10.1086/676426
15. World Health Organization. Infodemic 2021. WHO; 2021. Available from: www.who.int/health-topics/infodemic#tab=tab_1.
16. Autorità per le Garanzie nelle Comunicazioni (AGCOM). Osservatorio sul giornalismo - La professione alla prova dell'emergenza Covid-19 2020. Available from: www.agcom.it/documents/10179/20594011/Documento+generico+23-11-2020/41f9490a-44bd-4c61-9812-bf721b5c7cfe?version=1.0.
17. Mccormack L, Haun J, Sørensen K, Valerio M. Recommendations for advancing health literacy measurement. J Health Commun. 2013;18:9-14. doi: https://doi.org/10.1080/10810730.2013.829892
18. Morris NS, MacLean CD, Chew LD, Littenberg B. The single item literacy screener: Evaluation of a brief instrument to identify limited reading ability. BMC Fam Pract. 2006;7:1-7. doi: https://doi.org/10.1186/1471-2296-7-21
19. Rawson KA, Gunstad J, Hughes J, Spitznagel MB, Potter V, Waechter D, et al. The METER: A brief, self-administered measure of health literacy. J Gen Intern Med. 2010;25:67-71. doi: https://doi.org/10.1007/s11606-009-1158-7
20. Schwartz LM, Woloshin S, Welch HG. Can patients interpret health information? An assessment of the medical data interpretation test. Med Decis Mak. 2005;25:290-300. doi: https://doi.org/10.1177/0272989X05276860
21. Bonaccorsi G, Grazzini M, Pieri L, Santomauro F, Ciancio M, Lorini C. Assessment of health literacy and validation of single-item literacy screener (SILS) in a sample of Italian people. Ann Ist Super Sanità. 2017;53:205-12. doi: https://doi.org/10.4415/ANN_17_03_05
22. Baccolini V, Rosso A, Di Paolo C, Isonne C, Salerno C, Migliara G, et al. What is the prevalence of low health literacy in European Union member states? A systematic review and meta-analysis. J Gen Intern Med. 2021;36:753-61. doi: https://doi.org/10.1007/s11606-020-06407-8
23. Biasio LR, Corbellini G, D'Alessandro D. An Italian validation of "METER", an easy-to-use health literacy (HL) screener. Ann Ig. 2017;29:171-8. doi: https://doi.org/10.7416/ai.2017.2144
24. Catozzi D, Gualano MR, Lo Moro G, Voglino G, Bert F, Siliquini R. Italian validation of the medical data interpretation test (Mdit) for health literacy. EuroMediterranean Biomed J. 2021;16:27-30. doi: https://doi.org/10.3269/1970-5492.2021.16.6
25. Woloshin S, Schwartz LM, Welch HG. The effectiveness of a primer to help people understand risk. Ann Intern Med. 2007;146:256. doi: https://doi.org/10.7326/0003-4819-146-4-200702200-00004
26. Shah SFA, Ginossar T, Weiss D. "This is a Pakhtun disease": Pakhtun health journalists' perceptions of the barriers and facilitators to polio vaccine acceptance among the high-risk Pakhtun community in Pakistan. Vaccine. 2019;37:3694-703. doi: https://doi.org/10.1016/j.vaccine.2019.05.029
27. Hinnant A, Len-Ríos ME, Oh HJ. Are health journalists practices tied to their perceptions of audience? An attribution and expectancy-value approach. Health Commun. 2012;27:234-43. doi: https://doi.org/10.1080/10410236.2011.578331
28. Dempster G. The communication of health information through the media: public health opportunity. Aust N Z J Public Health. 2017;41:541. doi: https://doi.org/10.1111/1753-6405.12672
29. Shuchman M. Journalists as change agents in medicine and health care. JAMA. 2002;287:776. doi: https://doi.org/10.1001/jama.287.6.776-JMS0213-5-1
30. Wilson A, Smith D, Peel R, Robertson J, Kypri K. A quantitative analysis of the quality and content of the health advice in popular Australian magazines. Aust N Z J Public Health. 2017;41:256-8. doi: https://doi.org/10.1111/1753-6405.12617
31. Mikulak A. Mismatches between "scientific" and "non-scientific" ways of knowing and their contributions to public understanding of science. Integr Psychol Behav Sci. 2011;45:201-15. doi: https://doi.org/10.1007/s12124-011-9157-8
32. Sharma DC, Pathak A, Chaurasia RN, Joshi D, Singh RK, Mishra VN. Fighting infodemic: Need for robust health journalism in India. Diabetes Metab Syndr Clin Res Rev. 2020;14:1445-7. doi: https://doi.org/10.1016/j.dsx.2020.07.039
33. Gualano MR, Lo Moro G, Voglino G, Bert F, Siliquini R. Is the pandemic leading to a crisis of trust? Insights from an Italian nationwide study. Public Health. 2022;202:32-4. doi: https://doi.org/10.1016/j.puhe.2021.10.015
34. Cudjoe J, Delva S, Cajita M, Han HR. Empirically tested health literacy frameworks. Heal Lit Res Pract. 2020;4:e22-44. doi: https://doi.org/10.3928/24748307-20191025-01
35. Sørensen K, Pelikan JM, Röthlin F, Ganahl K, Slonska Z, Doyle G, et al. Health literacy in Europe: Comparative results of the European health literacy survey (HLS-EU). Eur J Public Health. 2015;25:1053-8. doi: https://doi.org/10.1093/eurpub/ckv043
36. Goodman MS, Griffey RT, Carpenter CR, Blanchard M, Kaphingst KA. Do subjective measures improve the ability to identify limited health literacy in a clinical setting? J Am Board Fam Med. 2015;28:584-94. doi: https://doi.org/10.3122/jabfm.2015.05.150037