Awareness and use of home remedies in Italy’s alps: a population-based cross-sectional telephone survey

Wolfgang Wiedermann1, Dietmar Ausserhofer2,3, Anna Vögele2, Ulrich Becker4, Giuliano Piccoliori2, Christian J. Wiedermann2,5* and Adolf Engl2

Abstract
Background: Belief in complementary and alternative medicine practices is related to reduced preparedness for vaccination. This study aimed to assess home remedy awareness and use in South Tyrol, where vaccination rates in the coronavirus pandemic were lowest in Italy and differed between German- and Italian-speaking inhabitants.

Methods: A population-based survey was conducted in 2014 and analyzed using descriptive statistics, multiple logistic regression, and latent class analysis.

Results: Of the representative sample of 504 survey respondents, 357 (70.8%) participants (43.0% male; primary language German, 76.5%) reported to use home remedies. Most commonly reported home remedies were teas (48.2%), plants (21.0%), and compresses (19.5%). Participants from rural regions were less likely (odds ratio 0.35, 95% confidence interval 0.19–0.67), while female (2.62, 1.69–4.10) and German-speaking participants (5.52, 2.91–9.88) were more likely to use home remedies. Latent classes of home remedies were “alcoholic home remedies” (21.4%) and “non-alcohol-containing home remedies” (78.6%). Compared to the “non-alcohol-containing home remedies” class, members of the “alcoholic home remedies” class were more likely to live in an urban region, to be male and German speakers.

Conclusion: In addition to residence and sex, language group membership associates with awareness and use of home remedies. Home remedies likely contribute to socio-cultural differences between the language groups in the Italian Alps. If the observed associations explain the lower vaccination rates in South Tyrol among German speakers requires further study.

Keywords: Language group, Vaccine hesitancy, Complementary and alternative medicine, Latent class analysis

Introduction
On December 16, 2021, The New York Times reported that “in Italy’s alps, traditional medicine flourishes, as does Covid-19”, because the province of Bolzano had the country’s highest level of coronavirus infection and lowest vaccination rate, which the article related to the suggestion that “many people there prefer to rely on the pure air and herbal remedies” [1]. South Tyrol, the Autonomous Province of Bolzano, is a northwestern region of Italy in the southern alps next to Austria (total population, 524,256) with approximately 70% German and 25% Italian-speaking inhabitants [2]. The different language groups are served by the same healthcare system and service provider. Of all Italian regions, South Tyrol was in the worst position in December 2021 in
terms of both vaccination rates and infection rates in the
pandemic, despite the fact that the health system in South
Tyrol is considered better than in many other regions [3].
The majority of the South Tyrolean population has Ger-
man as its mother tongue and it was found that the Ital-
ian language group was more likely to follow prescribed
pandemic control measures. In the group of teachers, for
example, only 3 per cent of Italian speakers were not vac-
cinated, compared to 20 per cent of German speakers [4].
It was suspected that the German-speaking South Tyro-
leans might have less confidence in the stately institu-
tions and recommendations, because in the historical develop-
ment the demarcation from Austria could still cause a
sceptical attitude towards the Italian central government.
In fact, a May 2021 pandemic survey showed that 70 per
cent of Italian speakers trusted the recommendations of
the Italian National Institute of Health, but only 44 per
cent of German speakers [4]. South Tyrol had low levels
of childhood vaccination before coronavirus pandemic,
with instead of the range of 90% only 71.9% of children 24
months of age jabbed against measles in 2017 [5].
Herbal medicine and other home remedies play an
important role in public beliefs about effective preven-
tion and treatment of diseases including the coronavirus
disease 2019 (COVID-19) [6]. Home remedy users may
hold negative views toward vaccines, such that a combi-
nation of little trust in the vaccine process and overesti-
mation of the risk associated with the vaccine itself may
contribute to vaccine hesitancy [7]. The belief that the
use of complementary and alternative medicine (CAM)
practices can eliminate the need for vaccination is related
to reluctance to receive the recommended vaccination
because of concerns and doubts about vaccines [8]. Par-
ents who have not vaccinated their children appear to
trust non-mainstream sources of information such as
CAM practitioners [9].
In 2014 in South Tyrol, awareness and use of home
remedies were investigated in a population-based cross-
sectional telephone survey and results were presented
at the annual conference of the German Society of Gen-
eral and Family Medicine (DGAM) in 2017; however, the
study design and findings have not been fully published
[10]. Since language group membership in South Tyrol
was associated with home remedies’ awareness and use
in the pre-pandemic study, these findings may contribute
to a better understanding of the potential relevance of
self-care in CAM and home remedies for local pandemic
preparedness and experience.
Therefore, the main objective of this study was to assess
and describe health self-management regarding the use
of home remedies in the general population of South
Tyrol. The aims were (1) to predict awareness of home
remedies using socio-demographic characteristics (i.e.,
age, gender, educational level, region of origin, and lan-
guage group), (2) to test the potential moderation effects
of demographic characteristics and language group
membership, (3) to explore patterns (i.e., latent classes)
of home remedy use, and (4) to test the associations
between socio-demographic characteristics and latent
class membership.

Methods
Sample and Procedure
Data were derived from a population-based cross-sec-
tional telephone survey study of health information-seek-
"ing behavior and awareness and use of home remedies
initiated before the coronavirus pandemic because of the
historically low vaccination rates in South Tyrol. Details
of the study design have been previously reported [11].
This article focuses on the awareness and patterns of the
use of home remedies. As described [11], the eligibility
criteria for participants were living in South Tyrol, pos-
sessing a landline (only private households, no business
phones), being at least 18 years old, and being declared
to either the German or the Italian language group.
According to data from the National Statistics Institute
(www.dati.istat.it) for 2015, from a total of 210,000 pri-
ivate households in South Tyrol, 122,000 (58%) had a lan-
dline, 208,000 (99%) of private households had at least
one mobile phone, and 92,000 (44%) used mobile phones.
In the present study, only landline users were included,
because mobile phone users cannot be limited to South
Tyrol. Computer-assisted telephone interviews were con-
ducted between August and September 2014 [11].
Data collection has also been described previously by
Ausserhofer and co-workers [11]. The telephone sur-
vey was performed by Apollis (www.apollis.it), a private
research institution in Bolzano (BZ), Italy, conduct-
"ing empirical studies for public and private clients with
a focus on education, labor market topics, active aging,
and survey research. The goal was to conduct at least
500 interviews. Professional interviewers contacted a
random sample of 1,445 households in South Tyrol with
landline numbers. A total of 162 phone numbers were
incorrect and 318 were not reachable. The remaining
965 were invited to participate in the telephone survey
and appointments were made to answer the phone sur-
voy: 458 did not participate in the second call despite
the appointment, for 46 no suitable appointment was
found during the study period, 53 were not capable of
participating, and 359 declined. Of the 507 phone inter-
views, three were excluded from the analyses as par-
ticipants were not eligible, resulting in a total of 504
interviews. The interviews lasted from three to 28 min
(mean,12 min) [11].
Measurements
Awareness and use of home remedies were assessed using self-developed, single items. First, the participants were asked if they were using any home remedies. If they answered with yes, they were asked to mention the most commonly used home remedies in order to quantify the mentions, they were coded according to active ingredients, processing forms and application methods. For statistical analyses, nominations of herbal medicine and dietary supplements, and self-help practices [12, 13] were categorized in a list of 9 home remedies (0 = “no” and 1 = “yes”): (1) tea, (2) other plants, (3) compress, (4) crème, salve, (5) arnica, (6) alcohol, herb liqueur, (7) chamomile, (8) vinegar, oil, and (9) marigold. Participants’ sociodemographic factors included age (birth year), biological sex (male/female), mother’s language (German/Italian), educational level (highest degree), and region of origin (rural/urban).

Statistical analysis
We used descriptive statistics, including means, standard deviations, frequencies, cross-tabulations, to describe the use of home remedies, and the characteristics of the sample. To avoid biases, sampling weights based on the age and sex distributions for the population of South Tyrol, according to the Provincial Statistics Institute for 2013, were employed for all analyses [2].

According to our research aims, we analyzed the data in four steps. First, we used logistic regression modeling to predict the prevalence of awareness of home remedies (0 = not aware of home remedies, 1 = aware of home remedies) based on the participants’ age (in years), biological sex (0 = male, 1 = female), educational level (0 = less than high school, 1 = high school +), region (0 = urban, 1 = rural), and language group (0 = Italian, 1 = German). The DFBETA statistics were used to evaluate the presence of potentially influential observations. Here, a respondent was flagged as a potentially influential observation if the DFBETA statistic exceeded threshold $2/\sqrt{n}$ [14]. The area under the receiver operating characteristic (ROC) curve (AUC) was used to evaluate the predictive accuracy of the multiple logistic regression model. Model fit was evaluated using the pseudo-R2 coefficient of determination.

Second, follow-up moderation analyses were used to test the hypothesis that sociodemographic characteristics moderate the relationship between language group membership and awareness of home remedies. The Johnson-Neyman approach [15] was applied to post-hoc probe the moderation effects. Sampling weights based on age and sex distributions for the population were incorporated into all logistic regression models.

Third, we completed a latent class analysis (LCA) to explore whether meaningful latent classes of respondents’ home remedy use could be identified from the nine home remedy indicators (known as the local independence assumption). Standardized bivariate residuals were used to assess potential violations of the local independence assumption. Because language group-specific sampling weights were not available, LC modeling was performed using the total sample.

Fourth, after selecting the appropriate number of latent classes, a latent-class multinomial logistic regression model was used to predict latent-class memberships. Because a two-step approach (i.e., modally assigned LC memberships regressed on predictors in a multinomial logistic regression) is prone to overestimating the influence of predictors [18], a three-step approach was applied [19]. Here, a latent class model is first estimated, and in the second step, modally assigned LC memberships are extracted for each observation. In the third step, the measurement error in the modal assignments is considered by incorporating classification uncertainty rates in latent-class logistic regressions [19]. Respondents’ age (in years), biological sex (0 = male, 1 = female), educational level (0 = less than high school, 1 = high school +), region (0 = urban, 1 = rural), and language group (0 = Italian, 1 = German) were used to predict latent-class memberships. The level of significance was set at $p < 0.05$. Data analysis was conducted using Mplus version 7.3 [20]. When predicting latent class memberships, the main effects as well as potential moderation effects of covariates on the relationship between language groups and latent class memberships were investigated [21].
Results
Characteristics of the study participants and representativeness of the sample are described in the first publication of the survey results on health information-seeking behavior [11]. Out of the 504 participants, 23 respondents (4.6%) had missing values in their demographic characteristics and were thus discarded from the analysis. Compared to participants with complete data, the subgroup with incomplete data was more likely to live in rural regions of South Tyrol (4 urban and 19 rural respondents; p=0.035). For the analysis sample (n=481), respondents’ (population-weighted) sociodemographic characteristics are summarized in Table 1.

Prediction of home remedies awareness
Out of the 481 participants, 357 (74.2%) reported to be aware of home remedies including herbal medicine, dietary supplements, and self-help practice. The mentions in German and Italian, and the relative nomination frequencies are shown in a Wordcloud graphic as Figure S1 and as Table S1 as supplementary material, respectively. Table 2 presents the logistic regression results. Overall, respondents from rural regions were less likely to use home remedies (OR = 0.35, 95% CI = 0.19–0.67). In contrast, female (OR = 2.62, 95% CI = 1.69–4.10) as well as German-speaking participants (OR = 5.25, 95% CI = 2.91–9.88) were significantly more likely to use home remedies. No significant main effects were observed for participants’ age or educational level.

Table 1 Descriptive statistics of the population weighted analysis sample (n=481) by language group of the population-based cross-sectional telephone survey, August to September 2014, in awareness and use of home remedies in Italy’s alps

| Variable                  | Language Group |
|---------------------------|----------------|
|                           | German (n=340) | Italian (n=141) | Total (n=481) |
| Age (years) M (SD)        | 47.8 (18.7)    | 51.1 (18.6)     | 48.8 (18.7)   |
| Sex                       |                |                |               |
| Male n (%)                | 167 (49.0)     | 70 (49.7)       | 237 (49.2)    |
| Female                    | 173 (51.0)     | 71 (50.3)       | 244 (50.8)    |
| Educational level n (%)   |                |                |               |
| Less than high school     | 208 (61.2)     | 61 (43.5)       | 269 (56.0)    |
| High school +             | 132 (38.8)     | 80 (56.5)       | 212 (44.0)    |
| Region n (%)              |                |                |               |
| Urban                     | 80 (23.3)      | 115 (81.7)      | 195 (40.4)    |
| Rural                     | 261 (76.7)     | 26 (18.3)       | 286 (59.6)    |
| Home remedy awareness n (%)|               |                |               |
| No                        | 72 (21.0)      | 59 (41.7)       | 131 (27.1)    |
| Yes                       | 268 (79.0)     | 82 (58.3)       | 350 (72.9)    |

The logistic regression model attained an area under the curve of AUC = 0.69 and a pseudo-R2 of 0.10. Overall, two observations showed a DFBETA statistic greater than 2/√481 = 0.091. Temporarily discarding the two potentially influential observations had no substantive effects on the logistic regression results, and were therefore retained in the analysis sample.

Follow-up moderation analysis suggested a significant interaction effect of age and language group (OR = 1.05, 95% CI = 1.02–1.08). No significant interaction effects were observed for biological sex, education, or region (all p > 0.21). After including the “age × language group” interaction term, the area under the curve increased to 0.71 and pseudo-R2 increased to 0.12. Figure 1 shows the conditional effect of being of German ethnicity on the probability of using home remedies as a function of the participants’ age. The Johnson-Neyman technique suggested a significant increase in the probability of using home remedies for participants older than 30.1 years of age. In contrast, the conditional effects were insignificant for participants ≤ 30.1 years of age.

Patterns of home remedies use
Among the 357 participants that reported use of home remedies, the three most frequent remedies were “teas” (48.2%), “plants” (21.0%), and “compresses” (19.5%). The three least frequently used home remedies were “chamomile” (13.3%), “vinegar, oil” (13.2%), and “marigold” (6.8%; cf. Table 3). Four observations had missing values for home remedy indicators. Full-information maximum likelihood estimation was applied to handle these missing data points.

The LC model fit indices and estimated class sizes (based on modal assignment) for k = 1–4 latent classes are summarized in Table 4. Sampling weights were incorporated into all LC models. In general, the AIC values decrease with every additional class, which hampers...
Fig. 1  Moderating effect of age on the relation between language groups and home remedies use. At 30.1 + years of age (cf. vertical line), the association between being of German ethnicity and home remedies use is statistically significant. Gray lines give the 95% CI of the conditional effect ($n = 481$).

Table 3  Descriptive statistics of population weighted sample that reports home remedy use by language group of the population-based cross-sectional telephone survey, August to September 2014, in Italy’s alps

| Variable                        | Language Group       | German ($n = 273$) | Italian ($n = 84$) | Total ($n = 357$) |
|---------------------------------|----------------------|--------------------|--------------------|-------------------|
| Age (years) $M$ (SD)            |                      | 48.9 (17.2)        | 47.6 (19.2)        | 48.6 (17.7)       |
| Sex $n$ (%)                     |                      |                    |                    |                   |
| Male                            |                      | 124 (45.2)         | 30 (35.8)          | 154 (43.0)        |
| Female                          |                      | 150 (54.8)         | 54 (64.2)          | 204 (57.0)        |
| Educational Level $n$ (%)       |                      |                    |                    |                   |
| Less than high school           |                      | 166 (60.8)         | 37 (43.8)          | 203 (56.8)        |
| High school +                   |                      | 107 (39.2)         | 47 (56.1)          | 154 (43.2)        |
| Region $n$ (%)                  |                      |                    |                    |                   |
| Urban                           |                      | 72 (26.3)          | 75 (89.2)          | 146 (41.0)        |
| Rural                           |                      | 202 (73.7)         | 9 (10.8)           | 211 (59.0)        |
| Home Remedy Use $n$ (%)         |                      |                    |                    |                   |
| Tea                             |                      | 148 (41.5)         | 24 (6.7)           | 172 (48.2)        |
| Plants                          |                      | 64 (17.9)          | 11 (3.2)           | 75 (21.0)         |
| Compresses                      |                      | 59 (16.5)          | 11 (3.0)           | 70 (19.5)         |
| Crème, Salve                    |                      | 61 (17.0)          | 4 (1.2)            | 65 (18.2)         |
| Arnica                          |                      | 52 (14.5)          | 4 (1.1)            | 56 (15.6)         |
| Alcohol, Herb Liqueur           |                      | 45 (12.5)          | 8 (2.3)            | 53 (14.8)         |
| Chamomile                       |                      | 41 (11.5)          | 6 (1.8)            | 48 (13.3)         |
| Vinegar, Oil                    |                      | 42 (11.7)          | 5 (1.5)            | 47 (13.2)         |
| Marigold                        |                      | 24 (6.8)           | 0 (0)              | 24 (6.8)          |

$n =$ frequencies, $M =$ mean, $SD =$ standard deviation
distinct model selection. Because this is also in line with the observation that AIC may tend to overestimate the number of latent classes, we primarily focused on BIC. BIC favored the 2-class solution. The adjusted and unadjusted LMR tests also suggested that the 2-class solution was sufficient to explain the dependence structure of home remedy indicators, which was confirmed by an excellent model fit of the 2-class solution (Pearson \(\chi^2(492)=440.6, p=0.953\)). Thus, we decided to retain the population weighted 2-class solution as the final model. The bivariate standardized residuals of the selected 2-class model were inspected to evaluate the local dependence assumption. Based on Bonferroni-adjusted tests (i.e., based on 36 (number of item pairs) \(\times\) 4 (number of comparisons per item pair) = 144 tests, an item pair was considered conspicuous when the standardized residuals exceed a z-score of 3.58), only the item pair “marigold – crème, salve” (\(z=5.29\)) was identified as potentially being conspicuous. Re-estimating the weighted 2-class model while allowing this residual covariance, did not significantly change the results. Thus, the initial 2-class model parameters are reported.

LC-specific patterns of home remedy use are summarized in Fig. 2 and can be described as either “alcoholic-containing home remedies” (\(n=77; 21.4\%\)) and “non-alcohol-containing home remedies (\(n=280; 78.6\%\)). Members of the “alcoholic-containing home remedies” most likely used arnica and alcohol/herb liqueur. The “non-alcohol-containing home remedies” group was more likely to use home remedies, such as teas, plants, compresses, and chamomile, but reported to almost never use arnica and alcohol/herb liqueur.

In the next step, covariates were entered into the LC model to predict latent class membership using the 3-step latent logistic regression approach described above. The descriptive characteristics of the two latent classes are summarized in Table 5. In addition to testing the main effects on class membership, all potential two-way interactions were investigated [21]. Non-significant predictors were omitted from the model because

| No. of classes | AIC  | BIC  | LMR  | adj. LMR | LC1 | LC2 | LC3 | LC4 |
|---------------|------|------|------|----------|-----|-----|-----|-----|
| 1             | 2916 | 2950 | -    | -        | 357 | -   | -   | -   |
| 2             | 2830 | 2904 | 0.005| 0.006    | 77  | 280 | -   | -   |
| 3             | 2804 | 2916 | 0.2653| 0.2698   | 54  | 250 | 53  | -   |
| 4             | 2794 | 2945 | 0.7127| 0.7159   | 59  | 58  | 234 | 6   |

Table 4 Summary of latent class model fit for weighted sample of the population-based cross-sectional telephone survey, August to September 2014, on awareness and use of home remedies in Italy’s alps (\(n=357, \text{AIC}\equiv\text{Akaike Information Criterion, BIC}\equiv\text{Bayes Information Criterion, LMR}\equiv\text{p-value of the Lo-Mendel-Rubin test, adj. LMR}\equiv\text{p-value of the adjusted LMR; indices suggesting best model fit are marked bold}\))

Fig. 2 Patterns of home remedies use for two latent classes. Latent Class 1 (LC1): “alcohol containing home remedies” pattern; Latent class 2 (LC2): “non-alcohol containing home remedies” (\(n=357\))
Table 5 Descriptive statistics of weighted sample by latent class membership of the population-based cross-sectional telephone survey, August to September 2014, on awareness and use of home remedies in Italy’s alps (n = 357)

| Variable          | LC1: “Alcohol-containing home remedies” | LC2: “Non-alcohol-containing home remedies” |
|-------------------|-----------------------------------------|--------------------------------------------|
| Class Size        | n (%)                                   | 77 (21.4)                                  | 280 (78.6)                                |
| Sex               | n (%)                                   | 42 (55.1)                                  | 111 (39.7)                                |
| Male              |                                          |                                            |                                           |
| Female            |                                          | 34 (44.9)                                  | 169 (60.3)                                |
| Ethnicity         | n (%)                                   | 66 (86.2)                                  | 207 (73.9)                                |
| German            |                                          |                                            |                                           |
| Italian           |                                          | 11 (13.8)                                  | 73 (26.1)                                 |
| Educational Level | n (%)                                   | 43 (56.0)                                  | 160 (56.1)                                |
| less than high    |                                          |                                            |                                           |
| school            |                                          | 34 (43.9)                                  | 121 (43.0)                                |
| high school +     |                                          |                                            |                                           |
| Region            | n (%)                                   | 35 (45.8)                                  | 111 (39.7)                                |
| urban             |                                          |                                            |                                           |
| rural             |                                          | 41 (54.2)                                  | 169 (60.3)                                |
| Age (years)       | M (SD)                                  | 50.6 (16.7)                                | 48.0 (17.9)                               |

In South Tyrol, due to the region’s high plant diversity and relatively isolated population, unique traditional botanical knowledge of medicinal plants has flourished, which traces its history back to prehistoric times [31]. Not surprisingly, among the 357 participants who reported use of home remedies in our study, the two most commonly reported home remedies were teas (48.2%) and plants (21.0%).

Two latent classes of home remedies were observed: “alcoholic home remedies” (21.4%; predominantly using arnica and alcohol/herb liqueur) and “non-alcohol-containing home remedies” (78.6%; almost never using arnica and alcohol/herb liqueur). Compared to the “non-alcohol-containing home remedies” class, members of the “alcoholic home remedies” class were more likely to be male (OR = 2.50, 95% CI = 1.07–5.85).

Discussion
The study showed that more than two-thirds of the population in South Tyrol (southern alps, Italy) reported using home remedies. Multiple logistic regression suggested that participants from rural regions were less likely, and female and German-speaking participants were more likely to use home remedies. In addition, follow-up moderation analysis suggested a significant interaction effect of participants’ age and being of German ethnicity. Here, the conditional effect of language group membership on home remedy use reached significance for participants older than 30.1 years of age.

In European high-income countries, awareness and use of home remedies have reached frequencies up to 75% of the populations. A study carried out in 2014 in Germany showed that approximately 80% of patients in general practice used home remedies [22]. In 2020 in Switzerland, home remedies were used by 65% of patients in general practice [23]. Several studies have shown that home remedies are used more frequently by female patients [22, 24, 25]. Common characteristics of CAM users include female gender, employment, higher education, private health insurance coverage, and higher-than-average incomes [26]. Female gender and higher socioeconomic status predict experience with CAM without predicting approval of CAM [27]. Women living in urban areas, highly educated, aged more than 40 years, who suffer from severe chronic back pain, were more inclined to go to CAM therapists [28], although female acupuncture users with osteoarthritides were more likely to reside in non-urban areas than those who did not use acupuncture [29]. In our study, awareness and use of home remedies were higher in urban than in rural regions and in women. In Italy, similar characteristics have been previously observed for CAM use in cancer patients in Tuscany [30].
use of home remedies are culturally sensitive even at the regional level within high-income countries.

Vaccine hesitance and CAM, including home remedies, have been linked both, at the population level, as well as among healthcare providers. For example, for influenza-like syndromes in Italy, only 14% of the general population received influenza vaccination annually, and almost 60% had never received vaccination, whereas approximately 36% of respondents regarded homeopathy as a helpful alternative because of perceived as safer [36]. Among French GPs, who are the first care option in infectious diseases, vaccine hesitancy was identified in up to 15% of cases and was associated with higher frequencies of occasional practice of CAM as compared to GPs who were not or only slightly vaccine-hesitant [37]. Adult population vaccination by GPs in Germany was linked to hesitant GPs’ self-vaccination behavior, which was independently associated with being a homeopathic GP [38].

Prior to the coronavirus pandemic, surveys have investigated community experience for pandemic preparedness and identified home remedies as a widely reported treatment [39]. A comprehensive study to evaluate biologically based CAM therapies such as herbs, foods, and supplements during the coronavirus pandemic via analysis of Google search engine statistics revealed that Google users in the USA and Great Britain displayed more potential interest than those in France, Germany, and Italy [40]. Awareness and use of home remedies is frequent in South Tyrol, and prevalence rates have independently increased for women, urban inhabitants, and German speakers, according to this survey. As the coronavirus vaccination rate distribution patterns between German- and Italian-speaking inhabitants in December 2021 coincided with this distribution characteristics of awareness and use of home remedies, it cannot be excluded that vaccination hesitance and CAM are also linked in South Tyrol, however, further studies are necessary to directly test this hypothesis.

A characteristic of the South Tyrolean society is its relatively strong ethnicization. This is primarily reflected in the institutionalized separation by language groups (e.g. linguistically separate school systems, allocation of public service jobs according to “ethnic proportionality”), but can also be clearly demonstrated in the economic sphere (agriculture and tourism as traditionally “German” domains, public service and industry for a long time as the primary economic base of the “Italians”). This ethnicization at its core is based on the economic differences of interest between the language milieus [41, 42]. It is reasonable to assume that this language group differences also affect home remedy and CAM use.

CAM use was an important predictor of changing to a healthier lifestyle during the first wave of the coronavirus pandemic and was not statistically significant associated with a change to an unhealthy lifestyle [43]. Since not using CAM was positively associated with GPs consultations [44], awareness and use of home remedies may help avoid unnecessary medical consultations. However, it may also indicate trust in and adherence to conventional medicine and support for preventive health measures, including vaccination. Although CAM literature cannot be simply described as being either pro- or antivaccination without considering finer areas of disagreement [45, 46], CAM has emerged as part of an expert system countering conventional medicine, and pro-vaccination health professionals, policymakers, and information providers seeking to address the role of CAM in vaccine rejection face significant challenges due to the epistemic basis of its proponents’ decisions [47]. Engaging with CAM providers appears to be a feasible and innovative avenue for providing vaccine information and designing communication tools aimed at vaccine-hesitant healthcare providers [48].

This study has several limitations. (i) The study database was representative of the adult population living in private households and using landline phones in South Tyrol in 2014. Smartphone ownership may have been underrepresented in this study because of design-related selection bias that may have impacted the awareness and use of home remedies [49]. The profile of the population that has only a mobile phone differs from that with a landline telephone. A study performed in Spain showed that persons contacted through a mobile phone were more likely to be a foreigner, to belong to the manual social class, to have a lower educational level, and to be a smoker than those contacted through a landline telephone [50]. (ii) Awareness and use of home remedies for children and adolescents (>18 years old) were not assessed because of the inclusion criteria. (iii) A self-reporting design was used where the respondents identified what home remedies they used. This makes it impossible to directly compare the data with results of home remedy studies in which standardized measurement methods such as the international questionnaire to measure usage of complementary and alternative medicine (I-CAM-Q) [12, 13] was used. (iv) In the statistical analysis, the awareness and use of home remedies and additional parameters were dichotomized. Response categories were collapsed into two categories because latent class modeling based on the original ordinal scales would require larger sample sizes to guarantee model convergence. (v) The survey was performed in 2014; characteristics of use and awareness of home remedies may have changed until today. Furthermore, differences in knowledge and use of home remedies between members of different language groups are not surprising. However, the possibility that this socio-cultural disparity could translate into
quite different vaccination behaviors in an economically well-developed, central European region with a relatively small catchment area gave a whole new meaning to the relatively old 2014 data. We therefore decided to conduct the analyses presented and to publish the results.

Conclusion
Disease prevention and self-management with the use of CAM is not negative per se as long as important preventive and diagnostic measures are not neglected, which seems to be frequently the case during the coronavirus pandemic. Language group membership determines the awareness and use of home remedies in Italian alps. In South Tyrol, compared to Italian speakers, German speakers’ greater awareness and more frequent use of home remedies may theoretically be linked to increased vaccine hesitancy and low vaccination rates of mandatory vaccination of children as well as vaccine against COVID-19 because of corresponding language distribution patterns. If the observed associations with home remedies, however, explain the lower vaccination rates in South Tyrol among German speakers requires further study.

Supplementary Information
The online version contains supplementary material available at https://doi.org/10.1186/s12906-022-03781-0.

Supplementary Material 1

Institutional Review Board Statement
According to Italian law, approval by the ethics committee and written informed consent are not required in non-clinical questionnaire-based or register-based population studies [Legislative Decree no. 121 of May 5, 2001]. The provision of information about the survey, its purpose, and voluntary participation in the telephone interview constituted implied consent. The study was performed in accordance with the Italian Personal Data Protection Law [Legislative Decree no. 196 of June 30, 2003] and the Declaration of Helsinki of the World Medical Association [51].

Author contributions
Conceptualization, Ulrich Becker, Giuliano Piccoliori, Adolf Engl and Christian Wiedermann; Data curation, Wolfgang Wiedermann, Dietmar Ausserhofer and Anna Vögele; Formal analysis, Wolfgang Wiedermann, Dietmar Ausserhofer, Ulrich Becker and Christian Wiedermann; Funding acquisition, Giuliano Piccoliori and Adolf Engl; Investigation, Anna Vögele; Methodology, Ulrich Becker; Project administration, Anna Vögele; Supervision, Adolf Engl; Validation, Wolfgang Wiedermann; Writing – original draft, Wolfgang Wiedermann, Dietmar Ausserhofer and Christian Wiedermann; Writing – review & editing, Wolfgang Wiedermann, Giuliano Piccoliori, Adolf Engl and Christian Wiedermann.

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Availability of data and materials
The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request. The datasets generated and/or analyzed during the current study are not publicly available because the survey results could be misused for market research purposes.

Declarations

Consent for publication
Participation at the telephone survey implied informed consent.

Competing of interests
The authors declare no conflicts of interest. The funders had no role in the study design, collection, analyses, or interpretation of data; writing of the manuscript; or decision to publish the results.

Author details
1 Department of Educational, School and Counseling Psychology, College of Education and Human Development, Missouri Prevention Science Institute, University of Missouri, Columbia, MO, USA. 2 Institute of General Practice and Public Health, Claudia - College of Health professions, Bolzano, Italy. 3 Institute of Nursing Science, Department Public Health, University of Basel, Basel, Switzerland. 4 Apollis Institute of Social Research and Opinion Polling, Bolzano, Italy. 5 Department of Public Health, Medical Decision Making and HTA, University of Health Sciences, Medical Informatics and Technology – Tyrol, Hall, Tyrol, Austria.

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