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Evaluation of a program for promoting physical activity and well-being: Friuli Venezia Giulia in Movimento

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Abstract

This article presents an evaluation of the "Friuli Venezia Giulia in Movimento" project, aimed at promoting the culture of movement and well-being in a region which is particularly affected by population ageing. The goals of the project reside in promoting appropriate lifestyles through the endorsement of healthy behaviours (physical activity, healthy nutrition, well-being); increasing the number of physically active people in the various municipal territories, by enhancing or creating new pedestrian paths that reflect the 10,000-step goal; enhancing the local territory by promoting the existing paths and the initiatives already in place; promoting new paths and environments conducive to physical activity for people of all ages; encouraging the creation of new "walking groups" and the adhesion of people to them to promote physical activity and socialisation, with the consequent improvement of psychophysical well-being. Although the evaluation is still on-going, the preliminary results—obtained by means of two surveys and a multilevel model—show that the initial steps of the project have been carried out satisfactorily and that Municipalities still need to be supported in order to achieve good participation on part of the citizens.

Keywords Pedestrian paths · Walking groups · 10,000 steps · Effectiveness evaluation · Multilevel governance · Local communities

1 Introduction

The "Friuli Venezia Giulia in Movimento" project aims at improving physical activity and physical health in the Italian region of Friuli Venezia Giulia. The project was born as an extension of the "Adesso" project, which was implemented in the period April

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2016–March 2017 and saw the participation of 136 Municipalities within the Region, achieving satisfying results in terms of satisfaction and involvement [34].

The project, implemented by Federsanità ANCI Friuli Venezia Giulia and supported by the Friuli Venezia Giulia Region, aims at enhancing the local territory by promoting the existing pedestrian paths and the initiatives already in place and by promoting new paths and environments that reflect the 10,000-step goal, conducive to increased physical activity. Deeply, the project's ultimate goal resides in promoting the adoption of healthy behaviours, increasing the number of physically active people in the various municipal territories, and encouraging the creation of new "walking groups" to foster citizens' movement and socialisation, resulting in enhanced psychophysical well-being for people of all ages.

Walking groups are spontaneous initiatives of organised groups, designed mainly for the over-65s but open to everyone, in which groups of people meet periodically to stroll along established routes, under the guidance of a specially trained walking leader. These programs are particularly active within the Friuli Venezia Giulia region and are associated with the prevention and promotion of health and healthy ageing, through the adoption and dissemination of correct lifestyles, and their consolidation is necessary in order to achieve this project's goals.

In the project design, the role of local administrations is fundamental for the implementation of permanent interdisciplinary strategies and policies for health according to the WHO Strategy and the various declarations from the Ottawa Charter, the Charter of Zagreb, and then again with the various indications on healthy ageing and sustainable and accessible urban planning. The project wishes to support the Municipalities in the implementation of projects, to coordinate the actions carried out—the ones already in progress and the new ones—and to promote various activities, in order to enhance the local resources and peculiarities synergistically.

The project is intended for:

- citizens, for the promotion of healthy lifestyles and, in particular, for the promotion of physical activity to improve health conditions and life quality as a whole;
- associations and spontaneous walking groups, learning about their direct experiences and supporting them in the promotion of physical activity aimed at enhancing people's psychophysical well-being and socialisation;
- Municipalities, as strategic actors for the implementation of intersectoral and permanent policies aimed at promoting the culture of healthy lifestyles, through the activation and consolidation of networks with the Regional Health Service, Bodies, Associations, and the Third Sector, the adoption of co-design methods between Municipalities and other subjects, and the planning of infrastructures designed to promote physical activity for individuals and groups.

The project also converges with 6 of the 17 Sustainable Development Goals, agreed by the United Nations Organization and valid from 2015 to 2030:

- Goal 3—"Ensure healthy lives and promote well-being for all at all ages", through the adoption and dissemination of correct lifestyles;
- Goal 11—"Make cities inclusive, safe, resilient and sustainable", by promoting accessible and sustainable mobility;
- Goal 12—"Ensure sustainable consumption and production patterns", through the promotion of reusable water bottles and responsible disposal;

- Goal 13—"Take urgent action to combat climate change and its impacts", by boosting sensitivity and responsibility for the fight against global heating;
- Goal 15—"Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss", through the fostering of sensitivity and responsibility for the terrestrial flora and fauna;
- Goal 17—"Revitalise the global partnership for sustainable development", by promoting and disseminating the Millennium Goals and the usefulness of individual and collective commitment.

This project's success will depend on the ability to identify its key components, evaluating for whom they are effective and under what conditions (see Kahn et al. [22]). The scientific literature on public health interventions includes a plethora of reports on successful programs aimed at promoting a healthy and active lifestyle in various parts of the world, documenting the steps involved in achieving the proposed goals and examining the factors which ensure positive outcomes and those characterising the inability to achieve success: for instance, the Australian study by Brown et al. [2], the U.S.A.-based studies by Brownson et al. [3], Chriqui et al. [11], Huberty et al. [20], and Reger-Nash et al. [35], the studies by Chad et al. [8] and Craig et al. [10], focused on Canada, the Belgian studies by Dubuy et al. [13] and De Smedt et al. [14], the Norwegian one by Lorentzen et al. [27]. With a view to increasing the effectiveness of the implemented interventions, it is necessary to learn from successes and failures of similar programs carried out in the past. The project's effectiveness evaluation aims at analysing whether the actions undertaken within the project will have achieved the desired effects. The evaluation involves all the actors that the project is intended for: it is, therefore, a multilevel evaluation, whose results can be used either jointly or separately. Indeed, it is crucial to measure actions' effectiveness at multiple levels, as virtuous results can be attained when all actors play their part [5].

The remainder of the paper is organised as follows: Sect. 2 provides an overview of the 38 Municipalities' main characteristics, along with regional data on health and physical activity levels; Sect. 3 exposes the on-going evaluation plan, showing data taken from questionnaires administered to Municipalities and citizens and the results from a multilevel model; finally, some concluding remarks are presented in Sect. 4.

2 Case study Municipalities and regional overview

Through a dedicated call for proposals, all the Municipalities in the Friuli Venezia Giulia region shall potentially be involved in the project, even in aggregate form, with the aim of encouraging actions that enhance both human and environmental resources and that concern the health of citizens through the promotion of correct lifestyles and healthy ageing, the contrast of loneliness, the inclusion of fragile and/or disadvantaged people and, additionally, the environmental and tourist enhancement, thus continuing the experiences of multilevel governance and scaling-up already experienced with the ADESSO project.

The call for proposals welcomed 30 applications, all of which were accepted for funding. Some of the proposals involve pedestrian paths crossing the territory of more than just the leading Municipality: out of the 30 presented plans, 23 see the participation of a single Municipality, 6 involve 2 Municipalities, and 1 sees the participation of 4 Municipalities; therefore, by including the partner Municipalities (i.e. those involved

in the projects presented by others), at least 38 Municipalities—and their citizens—will be able to benefit from the plan.

Figure 1 shows the geographical location of the 38 Municipalities within the territory of the Friuli Venezia Giulia region. Leading Municipalities are highlighted in darker colour, while partner Municipalities are highlighted in lighter colour.

The 38 participating Municipalities represent 17.67% of the total number of Municipalities in the Region and include 27.17% of the regional population, of which 48% is represented by over-50s (45% males and 55% females) and 25% by over-65s (42% males and 58% females). Table 1 shows the Municipalities' demographic characteristics.

The average lifespan in Friuli Venezia Giulia is among the highest in Italy and population ageing represents a structural element: with an average age of 47.0 years and a proportion of residents aged 65 and over of 26.2% (ISTAT data, 01/01/2019), Friuli Venezia Giulia is the second oldest region in Italy, preceded only by Liguria. Moreover, it is the third region in Italy for the number of elderly residents relative to young people, preceded by the regions of Molise and Liguria. The Old-age index—sometimes also
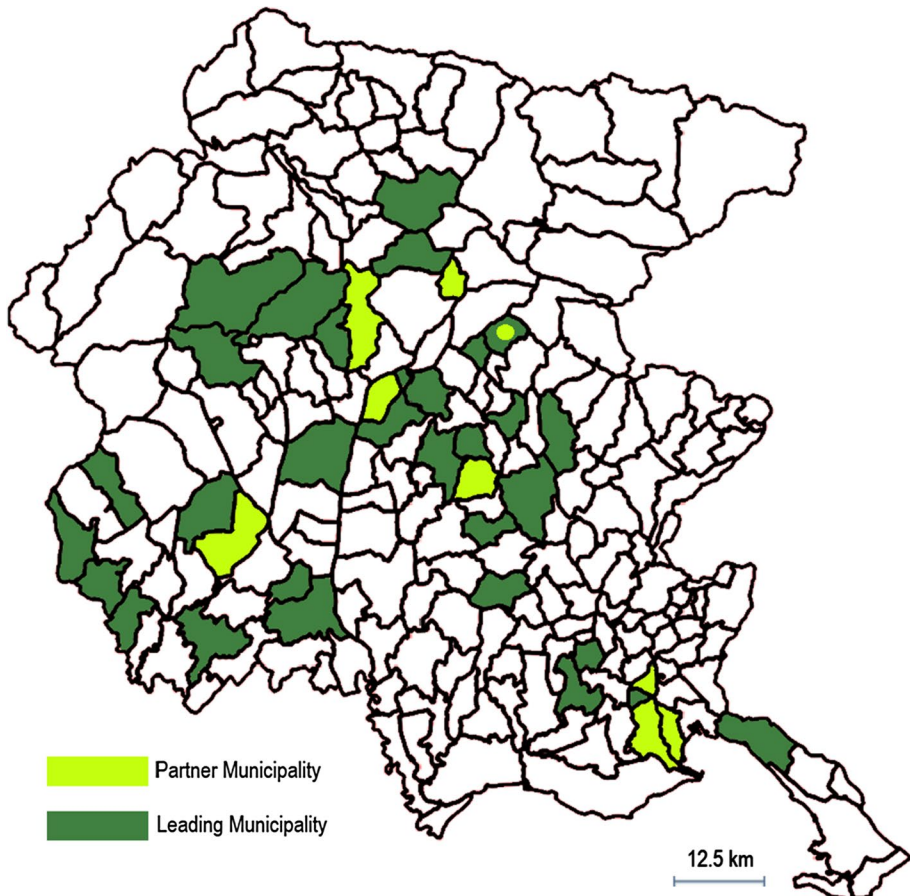

Fig. 1 Geographical location of the 38 Municipalities within Friuli Venezia Giulia

Table 1 Demographic characteristics of the examined Municipalities

Town	Total population	Population aged 18–69	Population aged 50+ (%)	Population aged 65+ (%)	Old-age index	Mean age	Median age
Aiello del Friuli	2223	1384	54.0	30.7	283.4	49.6	51
Artegna	2871	1898	50.4	26.6	234.0	47.5	50
Azzano Decimo	15,731	10,417	41.5	21.0	134.8	43.5	45
Bordano	726	505	50.6	24.2	234.7	47.2	50
Brugnera	9333	6233	42.5	21.4	147.3	43.8	45
Budoia	2551	1707	48.5	23.9	179.1	46.3	49
Campoformido	7873	5210	46.8	24.4	185.7	45.8	48
Caneva	6323	4060	48.4	26.1	202.0	46.7	48
Casarsa della Delizia	8390	5564	44.5	23.5	179.9	45.0	46
Cavazzo Carnico	998	671	52.6	27.5	282.5	48.7	51
Cervignano del Friuli	13,811	9209	45.7	24.0	193.1	45.7	47
Clauzetto	383	242	64.5	39.2	750.0	55.7	57
Cordenons	18,201	12,053	47.8	24.4	191.9	46.0	48
Duino-Aurisina	8471	5364	55.5	30.4	290.8	50.0	52
Fagagna	6285	4140	50.1	27.2	243.6	47.8	50
Frisanco	601	400	55.2	30.0	352.9	50.3	53
Majano	5920	3828	49.7	26.8	220.1	47.3	49
Martignacco	6838	4457	45.2	23.0	162.3	45.3	47
Montenars	505	343	57.6	29.9	321.3	50.7	54
Mortegliano	4938	3238	47.9	24.5	196.7	46.7	48
Moruzzo	2488	1612	49.2	25.9	192.8	46.5	49
Povoletto	5455	3519	49.8	26.6	213.1	47.2	49
Ragogna	2837	1882	51.1	27.4	259.3	48.5	50
Sacile	19,931	13,255	45.7	23.0	174.4	45.2	47
San Canzian d'Isonzo	6203	4061	48.2	25.6	208.0	46.9	49
San Daniele del Friuli	8007	5285	49.3	26.4	236.0	47.4	49

Table 1 (continued)

Town	Total population	Population aged 18–69	Population aged 50+ (%)	Population aged 65+ (%)	Old-age index	Mean age	Median age
San Pier d'Isonzo	2005	1298	48.9	25.7	194.0	47.0	49
San Quirino	4285	2811	47.4	24.3	178.9	46.0	48
San Vito al Tagliamento	15,123	10,108	44.4	22.9	167.8	45.0	46
Spilimbergo	12,121	7934	46.9	25.3	201.4	46.3	47
Staranzano	7256	4732	48.2	25.5	196.8	46.2	48
Tolmezzo	10,169	6751	49.0	26.1	233.1	47.0	49
Tramonti di Sopra	290	172	72.4	47.6	1725.0	59.5	62
Tramonti di Sotto	361	245	64.3	37.1	893.3	54.6	57
Tricesimo	7703	5006	49.5	26.4	218.0	47.2	49
Turriaco	2854	1909	45.5	23.0	183.8	45.8	47
Udine	99,377	65,166	48.3	26.3	223.8	47.1	49
Vito d'Asio	721	459	58.7	34.5	371.6	52.3	55
Overall	330,158	217,128	50.4	27.1	291.0	47.8	49

referred to as "Ageing index"—indicates the number of elders (aged 65 years and older) per 100 young people (from 0 to 14 years old) in a population. It is computed as:

$$Old - age\ Index = \frac{P \geq 65}{P \leq 14} * 100$$

As can be seen in Table 1, the involved Municipalities with the lowest Old-age index are Azzano Decimo, Brugnera, and Martignacco; those with the highest Old-age index are Tramonti di Sopra, Tramonti di Sotto, and Clauzetto, which are also the three least-populated Municipalities. On the other hand, the largest Municipalities are Udine, Sacile, and Cordenons. The table also shows the citizens' average and median ages for all participating Municipalities. The Municipalities with the lowest median age are Azzano Decimo, Brugnera, San Vito al Tagliamento, and Casarsa della Delizia; those with the highest median age are Tramonti di Sopra, Tramonti di Sotto, and Clauzetto.

To allow for a quick visual comparison, Fig. 2 shows the share of people aged 50 or over and 65 or over as a percentage of the total population and the Old-age index for each of the 38 examined Municipalities.

2.1 Health and physical activity overview

Excess weight refers to an excessive accumulation of body fat, generally caused by a sedentary lifestyle [43] and poor eating habits [6]. This condition reduces the duration and quality of life, favouring the onset and aggravation of numerous pathologies, and is a more frequent characteristic with increasing age, among males, among people with economic difficulties, and among those with a low level of education [4, 30, 42].

To measure the overweight and obesity rates in a population, the Body Mass Index (BMI) is commonly used [33]. It is given by the ratio of weight, expressed in kilograms, by the square of height expressed in square meters. Overweight persons are generally described as people with a BMI between 25.0 and 29.9 kg/m^2; obese people are defined as having a BMI equal to or greater than 30.0 kg/m^2. These threshold values are valid for persons aged 18 and over. For the definition of overweight and obesity among minors, it is possible to refer to the threshold values developed by Cole et al. [9], divided by gender and by age expressed in 0.5-year size classes.

Available data are based on self-reported weight and height values. It is important to note that the scientific literature indicates that these values are affected by systematic
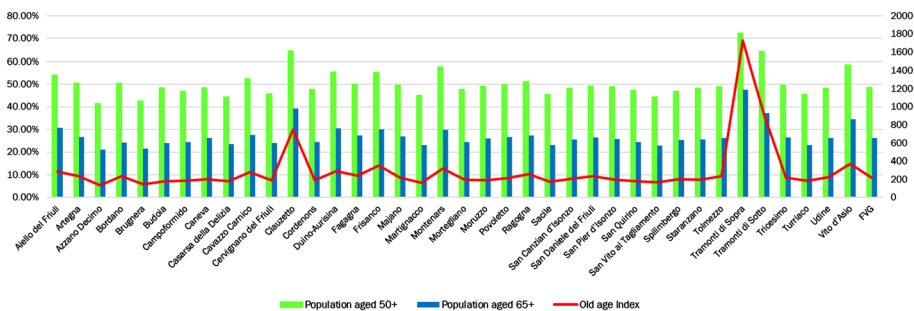

Fig. 2 Share of people aged 50 or over and 65 or over as a percentage of the total population and Old-age index in the 38 examined Municipalities

errors, as men generally tend to report a height greater than the real one, women a weight lower than the real one, overweight people a weight lower than the actual one, and the elderly tend to overestimate their height [32, 36, 41]. The available estimates are therefore underestimated compared to the actual levels, nevertheless, they remain valid for the purpose of evaluating temporal trends and regional differences.

Data from the PASSI surveillance, established by Istituto Superiore di Sanità, periodically estimate the prevalence of obese and overweight people among those aged from 18 to 69 in each Italian region; moreover, the ISTAT Multi-Purpose Survey "Aspects of Daily Life" provides an estimate of the proportion of children aged 6–17 suffering from excess weight. These data, for Friuli Venezia Giulia and the whole country, are summarised in Fig. 3.

Physical activity, when practised regularly, helps individuals of all ages to obtain a better quality of life, positively affecting both physical health and psychosocial well-being (e.g., Hallam et al. [18], Siegel et al. [38]). Common results suggest that there is no threshold below which physical activity does not produce positive health effects, counteracting a sedentary lifestyle is therefore very important, even when physical activity levels lower than those recommended by the guidelines are reached.

Data from the PASSI surveillance identify people as physically active, partially active, and sedentary, depending on the level of physical activity they declare to practise on a weekly basis. Respondents, aged 18–69, are classified as physically active if they either engage in at least 20 min of intense physical activity per day for no less than 3 days a week, or at least 30 min of moderate physical activity for no less than 5 days per week, or perform a work activity that involves high physical effort. Partially active individuals are those who do not perform heavy work and who practise physical activity only occasionally and without reaching the recommended levels. Finally, sedentary people do not engage in any type of physical activity in their free time and do not carry out a physically demanding job. These data, for the period 2015–2018, are summarised in Fig. 4. It is noteworthy that, in the Friuli Venezia Giulia region, the share of sedentary people is lower than the national average; straightforwardly, the share of active and partially active people is above average.

These data are based on self-reported behaviours and, as such, they are potentially biased due to the social desirability of the phenomenon, which could lead respondents to declare a level of physical activity that is higher than the real one, with consequent overestimation of the share of active people and underestimation of sedentary individuals in the population [1, 23, 29].
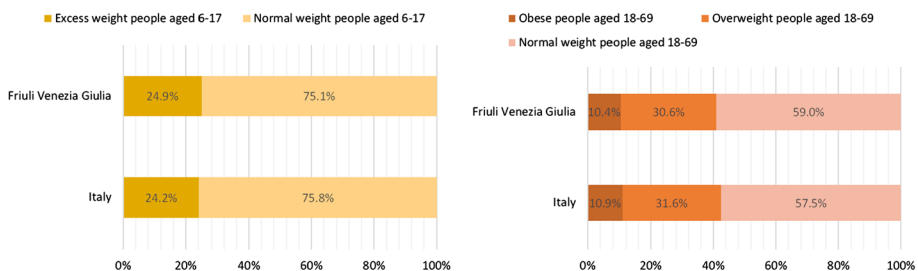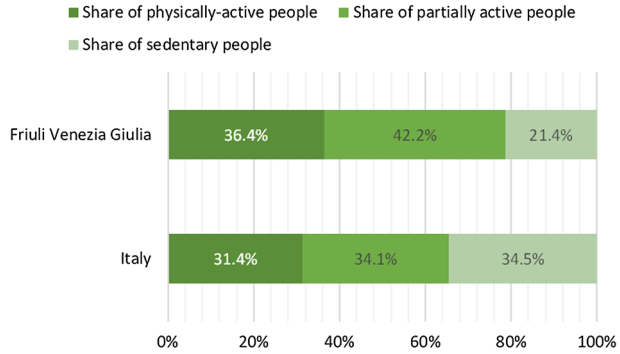

Fig. 3 Weight range of individuals aged 6–17 and 18–69, in Italy and Friuli Venezia Giulia. Elaboration from PASSI (2015–2018) and ISTAT (2016–2017) data

Fig. 4 Share of individuals aged 18–69 by physical activity level, in Italy and Friuli Venezia Giulia. Elaboration from PASSI (2015–2018) data

■ Share of physically-active people   ■ Share of partially active people
■ Share of sedentary people

Friuli Venezia Giulia	36.4%	42.2%	21.4%
Italy	31.4%	34.1%	34.5%

0%   20%   40%   60%   80%   100%

3 Evaluation plan and preliminary results

For evaluation purposes, it is necessary to focus on each of the actors involved in the project, which calls for a multilevel evaluation plan, involving participants at different levels: those who promote the project, the Municipalities taking part in the project, the organisations and/or associations that join, and the citizens who participate.

The project is financed by the Friuli Venezia Giulia region, which allocated funds to Federsanità ANCI Friuli Venezia Giulia that coordinates the project. These funds are then distributed among Municipalities and, finally, citizens will benefit from the renovated or newly-built pedestrian paths, with ultimate beneficial consequences on their physical health.

The project was developed through several phases. After the start-up phase, only concerning the Region and Federsanità ANCI Friuli Venezia Giulia, the project was publicly presented to all the interested Municipalities in April 2019. Then, the call for proposals was published in July 2019. After the collection and evaluation of the proposals, the final ranking was drawn up in January 2020, with the assignments to the 30 leading Municipalities. The most recent phase concerns the further development of the culture of health prevention and good practises among the Municipalities and their residents.

The levels and dimensions to be evaluated are illustrated in Fig. 5 and summarised in Table 2.

Nationwide, the direct health costs associated with the four main diseases related to physical inactivity (breast and colorectal cancer, type 2 diabetes, coronary artery disease)

Fig. 5 Levels to be evaluated

Region

Federsanità
ANCI F.V.G.

Municipalities

Citizens

Table 2 Dimensions to be evaluated at the Supra-municipal, Municipal, and citizens' level

Supra-municipal level	Municipal level	Citizens' level
Financial coverage	Policy interest, collaboration, and agreement amid the Municipal Council	Demographics
Promotion of the call for proposals	Long-term promotion of the new pedestrian paths	Willingness to use the paths when available
Assisting Municipalities	Experience with physical activity projects	Interest in social interactions
Mapping and networking of the routes for citizens and tourists	Presence of qualified personnel for physical activity promotion	Motivation and interest in physical activity
Identifying Municipalities' needs	Identifying citizens' needs	Quality of life
Stipulating frameworks for local policies	Communication structures for advertising the initiatives	Satisfaction about the pedestrian paths
Combating loneliness	Locally promoting healthy lifestyles	Attendance of promotional events

were estimated at 1.6 billion euros per year in 2015; adding these costs to the indirect ones, the total health cost could be quantified in over 12.1 billion [7].

Drawing from the main scientific literature concerning the economic benefits linked to the increase in physical activity and particularly in walking (e.g., Litman [25], Litman and Doherty [26], Sælensminde [37], Sohn et al. [40]), high heterogeneity in the estimation methods can be pointed out. However, putting together the most important recent studies at a European level [17], it looks like the average benefits given by the reduction in costs of medical treatments and fewer days of sick leave could approximately be quantified in as much as 0.37 euros per person per km travelled (average European costs extrapolated to 2017 levels). The amount of savings can usually only be calculated in the long term: in the short term, the higher medical costs due to injuries and trauma caused by more intense physical activity could even offset the savings, potentially making policies aimed at increasing physical activity a poor investment in economic terms.

As regards the present project, the Region allocated 254,500 euros in two different phases. Then, Federsanità ANCI Friuli Venezia Giulia promoted the project and issued the call for proposals. The average investment for each of the 38 leading and partner Municipalities was 6697 euros. The number of citizens residing in such Municipalities which will potentially benefit from the project, only considering those aged from 18 to 69 years, is 217,128. As the share of sedentary people of the same age group at a regional level is 21.4% (PASSI data, 2015–2018), about 1.17 euros were invested for each physically active or partially active adult citizen in the involved territory. Considering a saving for the health system of 0.37 euros per km travelled [17], the investment would be repaid if each of the involved citizens walked at least 3.16 km.

Indeed, this result is very difficult to achieve: good results in term of participation will depend on the ability of Municipalities to make a good promotion of the new pedestrian paths, by organising events and involving a great part of the population [24]. In a Municipality with a population of 100,000 people (such as Udine, the largest Municipality among those involved), an intervention aimed at increasing physical activity could be considered a profitable long-term investment if it costs less than 400 euros for each person who starts walking for at least 30 min a week (see National Institute for Health and Care Excellence [31]). This figure, though, can vary depending on citizens' age and the local context (i.e. rural or urban areas). In rural areas, compared to urban ones, the cumulative savings due to increased physical activity are usually lower, since the distance from urban centres is generally inversely correlated to adequate physical activity among the population [3, 21, 39].

3.1 Survey for Municipalities

In January 2020, after the call for proposals was closed but long before any of the paths were ready for use, a first questionnaire was sent to the contact persons of all Municipalities—both leading and partner ones—to gather information about the visibility of the call for proposals; the reasons that prompted the Municipalities to participate in the call; initiatives aimed at promoting health and correct lifestyles organised by the Municipalities in the past and those that they intend to organise in the short term; the perceived clarity of the call for proposals; the obstacles encountered; the assistance received; the expectations, the strengths, and the criticalities of the project.

Table 3 How did you find out about the project (more than one answer allowed)?

Answer	Frequency	% of answers
From public presentation meetings	11	50.0
From the media	6	27.3
From Federsanità ANCI F.V.G	3	13.6
From local news	2	9.1
From other Municipalities	1	4.5
From a councillor	1	4.5
From the Regional website	1	4.5

Table 4 Why has your Municipality decided to participate in the call for proposals (more than one answer allowed)?

Answer	Frequency	% of answers
To introduce healthy lifestyles	16	72.7
To provide citizens with a nice place to stroll	10	45.5
To map and network the routes	3	13.6
For tourism development	2	9.1
To implement new projects dedicated to health	2	9.1
For environmental enhancement	2	9.1

Some reminders were sent, in the following 2 months, to the Municipalities that had not completed the questionnaire. Sixty days after the questionnaire was first sent, the questionnaire had been filled in by 20 leading and 2 partner Municipalities.

The questionnaire included multiple-choice and open-ended questions. The open answers were treated by textual analysis and subsequently categorised to allow for the statistical processing of the results.

To the multiple-choice question "How did you find out about the project?", as shown in Table 3, the majority of Municipalities indicated that they had learned about the project through public presentation meetings and/or through the media.

This result reveals the good communication work carried out by Federsanità ANCI Friuli Venezia Giulia in the initial phase of the project, assisted by traditional media and by a number of Facebook posts mostly disseminated by institutional subjects and social pages about local promotion.

To the open question "Why has your Municipality decided to participate in the call for proposals?", 22 Municipalities gave their answers, providing one or more reasons which have been categorised and summarised in Table 4. Almost all Municipalities indicated the introduction of healthy lifestyles as the main reason, followed by the offer of a new service to citizens, a sign that the "philosophy" and the objectives underlying the project have been embraced by the participating Municipalities. The tourist aspect was not highly valued and, perhaps, it was not adequately promoted during the first phase concerning the project's presentation.

The questionnaire also included questions that concerned both aspects related to the performance of the working group and organisational, internal to the Municipalities that took part in the call.
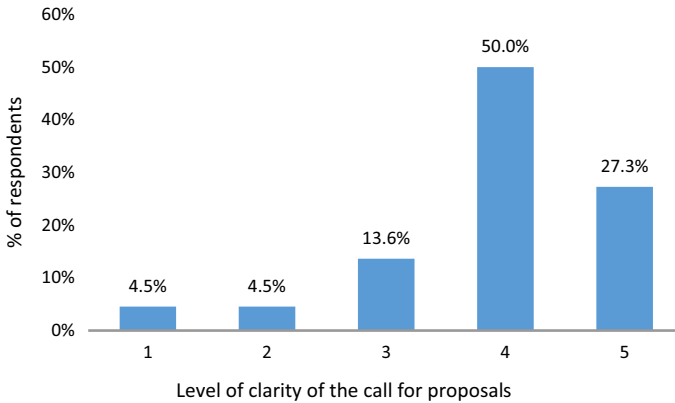
Fig. 6 On a scale ranging from a minimum of 1 to a maximum of 5, how do you judge the clarity of the call for proposals?
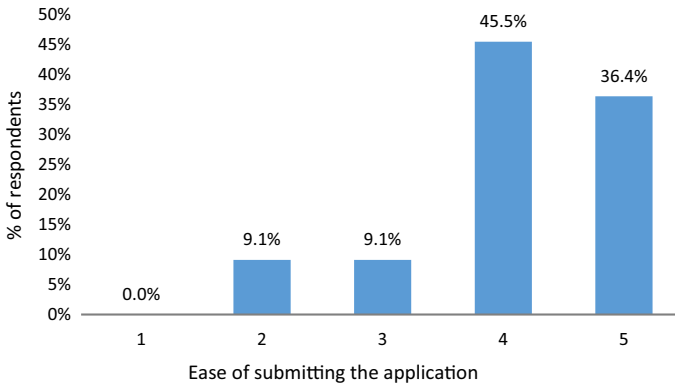

Fig. 7 On a scale ranging from a minimum of 1 to a maximum of 5, how do you judge the ease of submitting the application?

The assessment was carried out using a scale ranging from a minimum of 1 to a maximum of 5. The investigated aspects are:

• Performance of the working group (clarity of the call for proposals, ease of submitting the application, professionalism and promptness with which the working group was able to respond to any requests for assistance in completing the application);

• Internal organisational aspects of the Municipalities (degree of collaboration and agreement by the other members of the Municipal Council towards the initiative).

Overall, the Municipalities that took part in the survey positively judged the clarity of the call for proposals, as shown in Fig. 6. The most frequent score is "4" which also represents the median one. Overall, 77.3% of the respondents expressed a completely positive opinion (levels "4" and "5").

The aspect linked to the ease of submitting the application also obtains, on the whole, positive judgments, as shown in Fig. 7. In particular, the completely positive judgments ("4" and "5") represent 81.9% of the total. The most frequent judgment is "4" which also represents the median one.
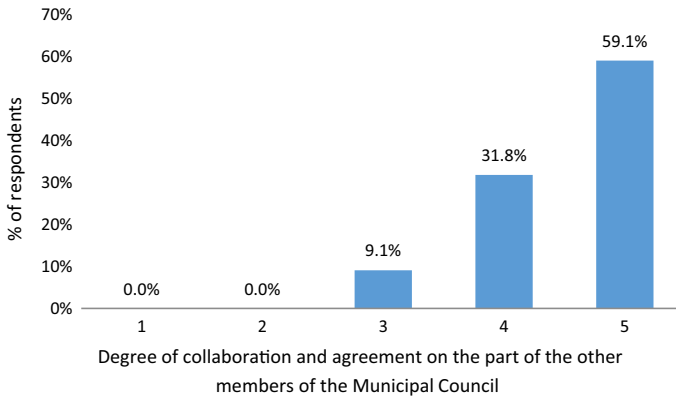
Fig. 8 On a scale ranging from a minimum of 1 to a maximum of 5, how do you judge the degree of collaboration and agreement on the part of the other members of the Municipal Council with respect to the project?

Table 5 What are your expectations regarding the project for the current year (more than one answer allowed)?

Answer	Frequency	% of answers
Increased usability of the paths within a short term	11	52.4
Promotion of the territory	7	33.3
Organisation of walking meetings	5	23.8
Encouraging walking and a healthy lifestyle	5	23.8
Advertising of the initiative	3	14.3

As regards the degree of collaboration and agreement on the part of the other members of the Municipal Council, the judgments vary from 3 to 5, so they are overall positive, as shown in Fig. 8. The most frequent judgment is the highest one (level "5"), which also represents the median one.

When asked "Did you have to request assistance in submitting the application?", 9 out of 22 Municipalities (41% of respondents) answered that they needed to do so. When asked to indicate any difficulties encountered in understanding the notice and/or in applying, 7 responses were received: in four cases it was noted that the call for proposals—at least in its first version—was not clear or precise enough, while in two cases the difficulty in satisfying the initial requirements was indicated, and in one case the onerousness of the required documentation was considered with respect to the benefits obtainable from the participation.

Again, out of 22 Municipalities, 15 indicated that they had organised other health and healthy lifestyle promotion events in the years 2018 and 2019, while 19 Municipalities declared that they intend to organise events of this kind by the end of the current year.

The Municipalities were then asked to describe, through an open response, the expectations regarding the project for the current year. All the Municipalities, with the exception of one, provided an answer, indicating one or more expectations (for a total of 31). Following the categorisation of the responses, it emerged that the most common expectation is to rapidly increase the usability of the identified paths. The results are shown in Table 5.

Table 6 What are the main strengths of the project (more than one answer allowed)?

Answer	Frequency	% of answers
Promotion of aggregation, health and correct lifestyles	12	57.1
Establishment of a supra-municipal network	8	38.1
Promotion and enhancement of the territory	6	28.6
Uniformity of the brand	3	14.3
Network communication	2	9.5
Tourism promotion	2	9.5

Table 7 What are the main critical issues regarding the project? Further suggestions? More than one answer allowed

Answer	Frequency	% of answers
Poor financial coverage	8	50
Uncertainty about resources for future promotion and mainte- nance	4	25
Many constraints, poorly described technical details	3	19
Long time until project's completion	1	6
Poor dissemination of the initiative	1	6
Financial reporting deadline hard to be respected	1	6

As for the strengths of the project—also expressed through an open response—the promotion of aggregation, health and correct lifestyles, the establishment of a supra-municipal network, and the promotion and enhancement of the territory were mentioned more frequently. Again, 21 out of 22 Municipalities provided an answer, while the total of the points mentioned was 33. The results are shown in Table 6.

Finally, with regards to any critical issues concerning the project and suggestions about aspects that could have been improved, replies were received from 16 Municipalities, for a total of 18 suggestions and critical issues mentioned through an open response; poor financial coverage, uncertainty about the resources for future promotion and maintenance of the paths, and issues concerning the call for proposals (many constraints and poor care in describing technical details) were the most frequently encountered problems. The results are shown in Table 7.

The project's motivations, expectations, strengths, and weaknesses (Tables 4, 5, 6 and 7) are summarised in Fig. 9. The percentages were made comparable by rescaling them. The surveyed Municipalities indicated the introduction of healthy lifestyles as the primary motivation, the increased usability of the paths within a short term as the main expectation, the promotion of aggregation, health and correct lifestyles as the greatest strength and, finally, the poor financial coverage as the major weakness.

3.2 Survey for citizens

On the 2nd of September 2020, we sent out a questionnaire aimed at gathering information about physical activity and lifestyle of citizens living in the Friuli Venezia Giulia region.
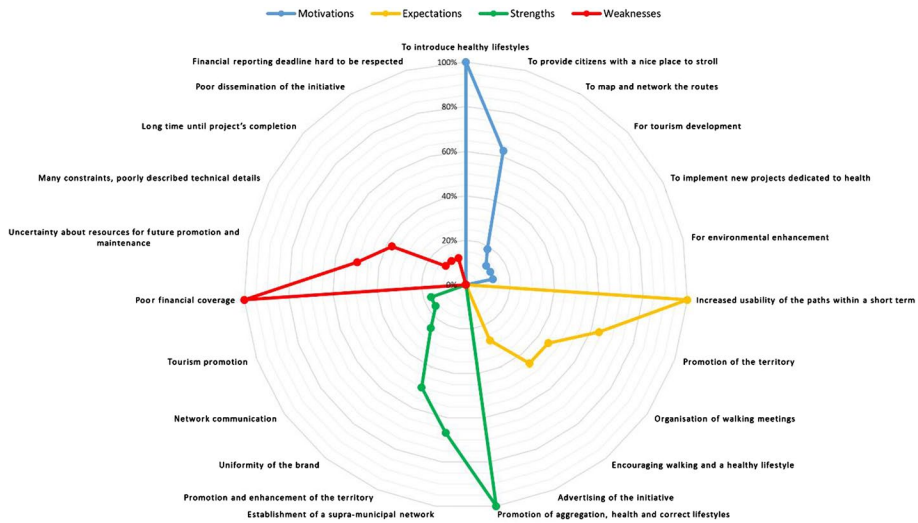
Fig. 9 Motivations, expectations, strengths, and weaknesses of the project

The survey was primarily advertised through Facebook and the Municipalities' support. Deeply, a short description of the project, followed by a link to the online survey, was provided in 43 Facebook groups and 67 Facebook pages aimed at grouping together the citizens from the main towns involved in the project; moreover, 22 Municipalities have accepted to publish a link to the questionnaire on their official websites and social media channels. However, the survey is open not only to the citizens from the involved towns but to all the citizens from the Friuli Venezia Giulia region; as such, we provided no territorial restrictions in this respect. The survey was closed on the 24th of November, when it was filled in by 1307 residents.

The questionnaire consists of three sections:

- Socio-demographic information: gender, age, marital status, education, work activity, household size, place of residence (Territorial Union of Municipalities), etc.;
- Physical activity and state of health: propensity to perform physical activity, information on the physical activity performed, reasons for either doing or not doing physical activity, perceived health status, etc.;
- Project "Friuli Venezia Giulia in Movimento. 10mila passi di salute": knowledge about the project, appreciation of the project's goals, whether being able to use a pedestrian path could lead to an increase in physical activity, etc.

Since all questions are mandatory, the questionnaires have no missing data. Given the method of administration, the resulting data can be said to come from a convenience sample; therefore, the analyses that will be carried out are only aimed at exploring the data and at describing them.

The first part of the analysis is dedicated to socio-demographic characteristics, to trace the profile of the citizens who completed the survey (Table 8).

932 citizens (71.3% of the sample) state to perform some kind of physical activity, mostly at an amateur level (93.5%). The remaining part of the sample (28.7%) state

Table 8 Distribution of the respondents by their socio-demographic characteristics

	No. of respondents	% of respondents
Gender		
Woman	978	74.8
Man	328	25.1
Other	1	0.1
Total	1307	100.0
Age class		
15–18 years old	19	1.5
19–24 years old	38	2.9
25–44 years old	402	30.8
45–64 years old	715	54.7
65 years old or over	133	10.2
Total	1307	100.0
Education level		
Elementary school	3	0.2
Middle school	129	9.9
High school	637	48.7
Bachelor's degree	140	10.7
Master's degree	282	21.6
Postgraduate master	93	7.1
Doctorate	23	1.8
Total	1307	100.0
Employment		
Housewife/househusband	52	4.0
Unemployed	57	4.4
Self-employed	157	12.0
Private worker	502	38.4
Public worker	285	21.8
Retired	199	15.2
Student	55	4.2
Total	1307	100.0
Household size		
1 person	182	13.9
2 or 3 people	737	56.4
4 people or more	388	29.7
Total	1307	100.0
Province of residence		
Udine	768	58.8
Pordenone	283	21.7
Gorizia	143	10.9
Trieste	113	8.6
Total	1307	100.0

to perform no physical activity at all: this figure is higher than the regional one. These citizens also provided their main reasons for not practising any physical activity, which are summarised in Fig. 10. Lack of time, motivation, and company are the main stated reasons; therefore, albeit these results are not generalisable to the whole population, Municipalities and Associations at various levels would need to focus on such issues in order to make people engage in more frequent physical activity, advertising it as a fun, sociable, and manageable pursuit [12].

1113 citizens (85.2% of the sample) claim that being able to use a pedestrian path in the vicinity of their homes could let them engage in more physical activity. This result, coherent with results from other projects implemented in the past (e.g., Chriqui et al. [11]) shows that nudging policies could influence people's habits, potentially improving their health [28].

652 citizens (49.9% of the sample) consider their Municipality to be weakly or not operative for what concerns the promotion of health and correct lifestyles, indicating that much still has to be done and that Municipalities need to be supported in order to achieve a good level of participation in the context of the present project.

Finally, 352 out of 1307 citizens (26.9%) state to be informed about the Friuli Venezia Giulia in Movimento project and the great majority of them (264 out of 352, 75.0%) highly appreciate its goals.

3.3 Multilevel evaluation

The next step concerns the evaluation of the extent to which the aspects identified in Table 2, observed at supra-municipal, municipal, and citizens level, affect physical health through the practise of physical activity. This is a typical multilevel structure with three levels: citizens nested within municipalities that are nested within supra-municipal units.
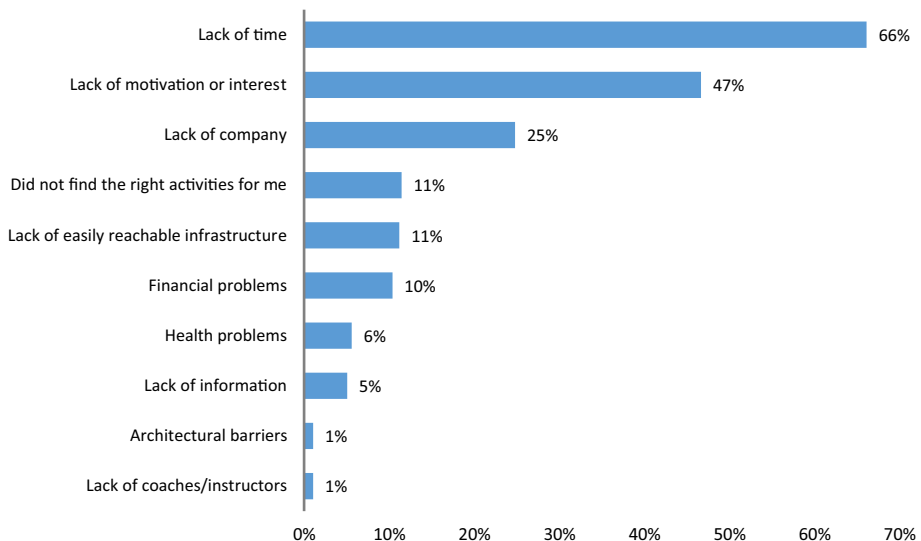

Fig. 10 Mainly, for which of these reasons do you not engage in physical activity? More than one answer allowed

We use data from the survey on physical activity and lifestyle, which contains data on 1307 citizens, to evaluate how individual and local/environmental characteristics affect people's propensity to perform physical activity. Unfortunately, because of privacy constraints, it was not possible to collect survey data at municipal level but only at Territorial Union of Municipalities (Unione Territoriale Intercomunale, UTI) level. TUMs are territorial units that group the 215 Municipalities of Friuli Venezia Giulia into 18 clusters (see Table 9). Due to this inconvenience, our analysis considers two levels only: citizens and TUMs. The latter can be seen as a proxy level for both municipal and supra-municipal levels.

The idea is to detect the factors that may affect the propensity to practise physical activity, both at citizens and TUMs level. Multilevel regression models are suitable tools that allow us to consider both aspects, as they incorporate the multilevel/hierarchical structures in the data: citizens who took part in the survey – level-one or elementary units—clustered within 18 TUMs—level two or cluster units [15, 16, 19].

We make use of 8 variables at the citizens level, which reflect the factors indicated in Table 2: demographic variables (gender, age class, educational level, number of cars owned by the household); willingness to use the paths when available (0 if no, 1 if yes); interest in social interactions as a reason to perform physical activity (0 if no, 1 if yes); quality of life (proxied by the number of days in good psychological health during the last 30 days); motivation and interest in physical activity (proxied by the appreciation of the project's goals, measured through a 4-point Likert scale). We could not include any variable concerning satisfaction about the pedestrian paths and attendance of promotional events, since the project is still on-going and not all the paths are ready to use. Then, we detect the variability between TUMs, by including TUM-specific random effects.

Table 9 Municipalities of Friuli Venezia Giulia, clustered into TUMs

Territorial Union of Municipalities	No. of Municipalities	% of Municipalities
UTI Agro Aquileiese	17	8
UTI Carso Isonzo Adriatico	10	5
UTI Collinare	15	7
UTI Collio—Alto Isonzo	15	7
UTI del Canal del Ferro—Val Canale	8	4
UTI del Friuli Centrale	11	5
UTI del Gemonese	6	3
UTI del Natisone	17	8
UTI del Noncello	7	3
UTI del Tagliamento	9	4
UTI del Torre	9	4
UTI della Carnia	28	13
UTI delle Valli e delle Dolomiti Friulane	22	10
UTI Giuliana	6	3
UTI Livenza—Cansiglio—Cavallo	6	3
UTI Medio Friuli	11	5
UTI Riviera—Bassa Friulana	12	6
UTI Sile e Meduna	6	3
Total	215	100

The dependent variable is the propensity to practise physical activity, a binary variable taking value 1 for those citizens who usually practise physical activity and 0 otherwise. Let Y_{ij} denote the binary dependent variable observed on the ith citizen within the jth TUM and $\pi_{ij} = \Pr(Y_{ij} = 1)$. Furthermore, let X_{kij} be the k level-one independent variables. Given the dependent variable and the hierarchical structure of the data, we use a random intercept logit model that incorporates level-two random effects u_j to take into account unobserved factors at cluster level:

$$\text{logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_0 + \beta_1 X_{1ij} + \cdots + \beta_k X_{Kij} + u_j, \ \ i = 1, 2, \dots n_j; \ j = 1, 2, \dots 18.$$

where $u_j \sim iid \ N(0, \sigma_u^2)$.

The multilevel analysis is stepwise. In the first step, we apply the so-called null model of the overall probability of practising physical activity, without adding the independent variables. It includes only TUM-specific random effects to describe between-TUM variations in the propensity of practising physical activity:

$$\text{logit}(\pi_{ij}) = \log\left(\frac{\pi_{ij}}{1 - \pi_{ij}}\right) = \beta_0 + u_j, \ i = 1, 2, \ \dots, \ n_j; \ j = 1, 2, \ \dots, \ 18.$$

Estimated regression parameters for this model are reported in Table 10.

The p-value of the Chi2-bar test shows that the variance of the level-two random effects is not equal to zero, meaning that the variability between TUMs significantly affects the probability of practising physical activity. The estimated intercept is 0.9527, while the estimated variance of level-two random effects is 0.1164. This means that the estimated probability that a citizen practises physical activity in an "average" TUM, i.e. the TUM with random effect $u_0 = 0$ on the logit scale, is

$$\hat{\pi}_{ij} = \frac{\exp(0.9527)}{1 + \exp(0.9527)} = 0.723$$

while the estimated probability for a "good" TUM where $u_G = 1.96\hat{\sigma}_u = 1.96\sqrt{0.1164} = 0.6687$ is

$$\hat{\pi}_{ij} = \frac{\exp(0.9527 + 0.6687)}{1 + \exp(0.9527 + 0.6687)} = 0.835$$

and for a "bad" TUM where $u_B = -1.96\hat{\sigma}_u = -1.96\sqrt{0.1164} = -0.6687$ is

Table 10 Estimated regression parameters for the null model

Variable	Coefficient	Std. Err.	p-value	95% C.I.
Intercept	0.9527	0.1087	0.000	0.7396, 1.1657
Random effects				
Variance of level-two random effects (variability between TUMs)	0.1164	0.0779		0.0313, 0.4325
LRT Chi2-bar(1)	7.27		0.0035	
Deviance	1556.97			

$$\hat{\pi}_{ij} = \frac{\exp(0.9527 - 0.6687)}{1 + \exp(0.9527 - 0.6687)} = 0.570.$$

In the second step, the model includes citizens' characteristics, as described above, with the TUM-specific random effects (Table 11).

Results from the model with citizens-level covariates show that a higher educational level, a higher number of cars in the household, interest in social interactions, and higher quality of life have a positive effect on the probability of performing physical activity. On the other hand, citizens aged 25–44 years, compared to those aged 15–24, show a lower probability of performing physical activity. The p-value of the Chi2-bar test shows that the variance of the level-two random effects is not equal to zero, meaning that the variability between TUMs significantly affects the probability of practising physical activity, while the estimated variance of level-two random effects is 0.080.

Table 11 Estimated regression parameters for the model with citizens-level covariates

Variable	Coefficient	Std. Err.	p-value	95% C.I.
Intercept	− 1.1447	0.6202	0.065	− 2.3603, 0.0709
Willingness to use the paths when available	0.1874	0.1789	0.295	− 0.1633, 0.5381
Educational level (reference category: Lower secondary education and lower)				
Upper secondary education	0.4847	0.2152	0.024	0.0629, 0.9065
Bachelor's degree	1.0396	0.2912	0.000	0.4689, 1.6103
Master's degree and higher	0.7054	0.2344	0.003	0.246, 1.1648
Gender (1: male)	0.2153	0.1571	0.170	− 0.0925, 0.5232
Class of ages (reference category: 15–24)				
25–44	− 0.8531	0.3407	0.012	− 1.5209, − 0.1853
45–64	− 0.2051	0.3326	0.537	− 0.857, 0.4468
65 or over	− 0.0375	0.3865	0.923	− 0.7951, 0.7200
Number of cars in the household (reference category: None)				
One	1.1977	0.5015	0.017	
Two	1.0398	0.4937	0.035	
Three or more	0.6452	0.5099	0.206	
Motivation and interest in physical activity (reference category: Not at all)				
Only a little	0.7558	1.1418	0.508	− 1.482, 2.9936
Rather much	0.0240	0.2660	0.928	− 0.4973, 0.5452
Very much	0.0933	0.1659	0.574	− 0.2318, 0.4184
Quality of life	0.0253	0.0078	0.001	0.0100, 0.0405
Interest in social interactions	0.2840	0.1453	0.051	− 0.0007, 0.5687
Random effects				
Variance of level-two random effects (variability between TUMs)	0.0800	0.0672		0.0154, 0.4151
LRT Chi-bar(1)	3.39		0.0327	
Deviance	1496.78			

4 Conclusions

In its early phases, the "Friuli Venezia Giulia in Movimento" project, which is primarily aimed at promoting correct lifestyles and at increasing the number of physically active people in the regional territory, through the creation and promotion of pedestrian paths in various Municipalities, saw the application of a participatory model that has favoured a lively and profitable exchange between Federsanità ANCI Friuli Venezia Giulia and the involved Municipalities, leading to an improvement of the overall quality of the project.

The first evaluation questionnaire, submitted to the Municipalities in the early months of 2020, had a satisfactory participation level, with answers submitted by 58% of the Municipalities involved in the project. Overall, the answers indicate the high quality of the work done by Federsanità ANCI Friuli Venezia Giulia in the project's preliminary steps, as well as a considerable interest of the Municipalities in the project's goals. In particular, 86% of the Municipalities that took part in the survey indicated their intention to organise new events to promote physical activity by the end of the current year. The survey also showed that most Municipalities wish to improve the usability of the identified paths within a short time, mainly to promote aggregation, health, and correct lifestyles.

The questionnaire submitted to citizens, on the other hand, shows that the possibility of using a pedestrian path close to home would lead most of them to engage in further physical activity but that many barriers are still present, which need to be taken into account by policymakers in order to increase citizens' physical activity.

A preliminary analysis performed by means of multilevel logit models indicates the presence of variability between TUMs (territorial units that group the 215 Municipalities of Friuli Venezia Giulia into 18 clusters) in citizens' propensity to practise physical activity.

As the evaluation plan is still on-going, further data that become available will allow us to assess the participation of associations and citizens, as well as to verify the impact of the project in terms of gain in health, social relations, quality of life, savings for the health system and tourism-related activities. Moreover, complete data at the Municipal and supra-municipal level will allow us to conduct a complex multilevel evaluation plan.

Availability of data and material Data shall be made available upon request.

Code availability Code shall be made available upon request.

Declarations

Conflicts of interest None.

References

1. Adams, S.A., Matthews, C.E., Ebbeling, C.B., Moore, C.G., Cunningham, J.E., Fulton, J., Hebert, J.R.: The effect of social desirability and social approval on self-reports of physical activity. Am. J. Epidemiol. **161**(4), 389–398 (2005)
2. Brown, W.J., Mummery, K., Eakin, E., Schofield, G.: 10,000 Steps Rockhampton: evaluation of a whole community approach to improving population levels of physical activity. J. Phys. Act. Health **3**(1), 1–14 (2006)
3. Brownson, R.C., Hagood, L., Lovegreen, S.L., Britton, B., Caito, N.M., Elliott, M.B., Tune, D.: A multilevel ecological approach to promoting walking in rural communities. Prev. Med. **41**(5–6), 837–842 (2005)
4. Busetta, G., Campolo, M.G., Panarello, D.: Weight-Based Discrimination in the Italian Labor Market: an Analysis of the Interaction with Gender and Ethnicity. J. Econ. Inequal. **18**(4), 617–637 (2020)
5. Castellano, R., Musella, G., Punzo, G.: The effect of environmental attitudes and policies on separate waste collection: the case of Insular Italy. Lett. Spat. Resour. Sci. **12**(1), 63–85 (2019)
6. Cawley, J.: The impact of obesity on wages. J. Hum. Resour. **39**(2), 451–474 (2004)
7. Centre for Economics and Business Research.: The economic cost of physical inactivity in Europe. An ISCA/CEBR report. London: CEBR. (2015). https://inactivity-time-bomb.nowwemove.com/download-report/The%20Economic%20Costs%20of%20Physical%20Inactivity%20in%20Europe%20(June%202015).pdf. Accessed 21 Sept 2020
8. Chad, K.E., Martin, L., Gryba, C., Kisby, R., Schultz, S., Spink, K.S.: Assessing the effectiveness of a community-based intervention on physical activity behaviour. Med. Sci. Sports Exerc. **35**(5), S188 (2003)
9. Cole, T.J., Bellizzi, M.C., Flegal, K.M., Dietz, W.H.: Establishing a standard definition for child overweight and obesity worldwide: international survey. BMJ **320**(7244), 1240 (2000)
10. Craig, C.L., Tudor-Locke, C., Bauman, A.: Twelve-month effects of Canada on the Move: a population-wide campaign to promote pedometer use and walking. Health Educ. Res. **22**(3), 406–413 (2007)
11. Chriqui, J.F., Leider, J., Thrun, E., Nicholson, L.M., Slater, S.: Communities on the move: pedestrian-oriented zoning as a facilitator of adult active travel to work in the United States. Front. Public Health **4**, 71 (2016)
12. Devereux-Fitzgerald, A., Powell, R., Dewhurst, A., French, D.P.: The acceptability of physical activity interventions to older adults: a systematic review and meta-synthesis. Soc. Sci. Med. **158**, 14–23 (2016)
13. Dubuy, V., De Cocker, K.A., De Bourdeaudhuij, I.M., Maes, L., Metsu, P., Van Acker, R., Cardon, G.M.: '10 000 Steps Flanders': evaluation of the state-wide dissemination of a physical activity intervention in Flanders. Health Educ. Res. **28**(3), 546–551 (2013)
14. De Smedt, D., De Cocker, K., Annemans, L., De Bourdeaudhuij, I., Cardon, G.: A cost-effectiveness study of the community-based intervention '10 000 Steps Ghent.' Public Health Nutr. **15**(3), 442–451 (2012)
15. Gelman, A., Jennifer, H.: Data Analysis Using Regression and Multilevel/Hierarchical Models. Cambridge University Press, New York (2006)
16. Goldstein, H.: Multilevel Statistical Models, 4th edn. Wiley, Chichester (2011)
17. Gössling, S., Choi, A., Dekker, K., Metzler, D.: The social cost of automobility, cycling and walking in the European Union. Ecol. Econ. **158**, 65–74 (2019)
18. Hallam, K.T., Bilsborough, S., de Courten, M.: "Happy feet": evaluating the benefits of a 100-day 10,000 step challenge on mental health and wellbeing. BMC Psychiatry **18**(1), 19 (2018)
19. Hox, J.: Multilevel Analysis Techniques and Applications, 2nd edn. Routledge, New York (2010)
20. Huberty, J.L., Dodge, T., Peterson, K., Balluff, M.: Activate Omaha: the journey to an active living environment. Am. J. Prev. Med. **37**(6), S428–S435 (2009)
21. Jilcott, S.B., Evenson, K.R., Laraia, B.A., Ammerman, A.S.: Association between physical activity and proximity to physical activity resources among low-income, midlife women. Prev. Chronic Dis. **4**(1), A04 (2007)
22. Kahn, E.B., Ramsey, L.T., Brownson, R.C., Heath, G.W., Howze, E.H., Powell, K.E., Corso, P.: The effectiveness of interventions to increase physical activity: a systematic review. Am. J. Prev. Med. **22**(4), 73–107 (2002)
23. Klesges, L.M., Baranowski, T., Beech, B., Cullen, K., Murray, D.M., Rochon, J., Pratt, C.: Social desirability bias in self-reported dietary, physical activity and weight concerns measures in 8-to 10-year-old African-American girls: results from the Girls Health Enrichment Multisite Studies (GEMS). Prev. Med. **38**, 78–87 (2004)

24. Leavy, J.E., Bull, F.C., Rosenberg, M., Bauman, A.: Physical activity mass media campaigns and their evaluation: a systematic review of the literature 2003–2010. Health Educ. Res. **26**(6), 1060–1085 (2011)
25. Litman, T.A.: Economic value of walkability. Transp. Res. Rec. **1828**(1), 3–11 (2003)
26. Litman, T.A., Doherty, E.: Transportation cost and benefit analysis: techniques, estimates and implications. Victoria Transport Policy Institute, Victoria. (2011). http://www.vtpi.org/tca/. Accessed 21 Sept 2020
27. Lorentzen, C., Ommundsen, Y., Jenum, A.K., Holme, I.: The "Romsås in Motion" community intervention: program exposure and psychosocial mediated relationships to change in stages of change in physical activity. Int. J. Behav. Nutr. Phys. Activ., **4**(15), 1–12 (2007)
28. Marteau, T.M., Ogilvie, D., Roland, M., Suhrcke, M., Kelly, M.P.: Judging nudging: can nudging improve population health? Bmj, **342**(d228), 263–265 (2011)
29. Merom, D., Rissel, C., Phongsavan, P., Smith, B.J., Van Kemenade, C., Brown, W.J., Bauman, A.E.: Promoting walking with pedometers in the community: the step-by-step trial. Am. J. Prev. Med. **32**(4), 290–297 (2007)
30. Mokdad, A.H., Ford, E.S., Bowman, B.A., Dietz, W.H., Vinicor, F., Bales, V.S., Marks, J.S.: Prevalence of obesity, diabetes, and obesity-related health risk factors, 2001. JAMA **289**(1), 76–79 (2003)
31. National Institute for Health and Care Excellence.: Physical activity and the environment. NICE guideline [NG90]. (2018). https://www.nice.org.uk/guidance/ng90. Accessed 21 Sept 2020
32. Niedhammer, I., Bugel, I., Bonenfant, S., Goldberg, M., Leclerc, A.: Validity of self-reported weight and height in the French GAZEL cohort. Int. J. Obes. **24**(9), 1111–1118 (2000)
33. Nuttall, F.Q.: Body mass index: obesity, BMI, and health: a critical review. Nutr. Today **50**(3), 117–128 (2015)
34. Pagani, L., Zamaro, G.: The evaluation of the regional project "ADESSO" as an example of multilevel networking and governance. In: D'Ambra, L., (ed.), Proceedings of the 8th Scientific Conference on Innovation & Society - Statistical Methods for Evaluation and Quality. ISBN: 9788883991073 (2017)
35. Reger-Nash, B., Bauman, A., Booth-Butterfield, S., Cooper, L., Smith, H., Chey, T., Simon, K.J.: Wheeling walks: evaluation of a media-based community intervention. Fam. Community Health **28**(1), 64–78 (2005)
36. Rowland, M.L.: Self-reported weight and height. Am. J. Clin. Nutr. **52**(6), 1125–1133 (1990)
37. Sælensminde, K.: Cost–benefit analyses of walking and cycling track networks taking into account insecurity, health effects and external costs of motorized traffic. Transport. Res. Part A Policy Pract. **38**(8), 593–606 (2004)
38. Siegel, P.Z., Brackbill, R.M., Heath, G.W.: The epidemiology of walking for exercise: implications for promoting activity among sedentary groups. Am. J. Public Health **85**(5), 706–710 (1995)
39. Sjolie, A.N., Thuen, F.: School journeys and leisure activities in rural and urban adolescents in Norway. Health Promot. Int. **17**(1), 21–30 (2002)
40. Sohn, D.W., Moudon, A.V., Lee, J.: The economic value of walkable neighborhoods. Urban Des. Int. **17**(2), 115–128 (2012)
41. Spencer, E.A., Appleby, P.N., Davey, G.K., Key, T.J.: Validity of self-reported height and weight in 4808 EPIC–Oxford participants. Public Health Nutr. **5**(4), 561–565 (2002)
42. Williams, E.P., Mesidor, M., Winters, K., Dubbert, P.M., Wyatt, S.B.: Overweight and obesity: prevalence, consequences, and causes of a growing public health problem. Curr. Obes. Rep. **4**(3), 363–370 (2015)
43. Yuenyongchaiwat, K.: Effects of 10,000 steps a day on physical and mental health in overweight participants in a community setting: a preliminary study. Braz. J. Phys. Ther. **20**(4), 367–373 (2016)