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ORIGINAL ARTICLE

Just keep on swimming: the policy effectiveness of building swimming pools

Q9 Erik Thibaut^{a,b,c} , Marjolein Van Poppel^{a,d} and Jeroen Scheerder^a

^aKU Leuven, Policy in Sports & Physical Activity Research Group, Leuven, Belgium; ^bUniversity

Q1 College Thomas More, Turnhout, Belgium; ^cPolicy Research Center on Sport, Leuven, Belgium;

Q2 ^dFlemish Institute of Sport Management and Recreation Policy, Sint-Niklaas, Belgium

ABSTRACT

This study investigates the relation between swimming infrastructure and participation in Flanders. First, we investigate whether the availability of swimming facilities is related to higher swimming participation and/or frequency. Second, the focus is on the relationship with quality aspects of swimming pools. A number of datasets are combined, namely two large-scale sports participation surveys (children $N=2,920$; adults $N=3,781$), a sports infrastructure database, and a survey among swimming pools ($N=125$). The results indicate that the presence of a swimming pool in the municipality is not related to swimming participation (children and adults) and swimming frequency (adults), while also no effect is found for price reductions and quality aspects (i.e. age of the infrastructure, cafeteria). The results suggest that the swimming infrastructure in Flanders seems to be sufficient and that alternative strategies for a (sole) focus on the entrance fee and building (more) swimming pools needs to be addressed to increase swimming participation. The results also indicate that women, elderly, and citizens that had a longer education, have a lower probability to swim and swim less frequently and that further focussing on removing the barriers that they face would be a viable strategy to increase overall swimming participation.

KEYWORDS

Sports policy; sports facilities; socio-ecological model; determinants; swimming pools

Introduction

Qualitative and safe sports infrastructure is necessary for sports participation. A lot of sports activities would not be possible without the right sports infrastructure: without a swimming pool no swimming, without a soccer field no soccer. (Weyts, 2019)

The above quote from the Flemish minister of sports makes clear that the provision of sports facilities is one of the main policy tools that is used on both the local and the national/regional level (see also Elmoose-Østerlund & Iversen, 2020; Hoekman et al., 2016; Limstrand, 2008). This is in line with the socio-ecological model (Bronfenbrenner, 1979; Sallis et al., 2006) that emphasises the environmental and policy context of

behaviour (Sallis et al., 2008). Using sports facilities should be situated in interaction with the physical and socio-cultural surroundings (e.g. Bronfenbrenner, 1979; Hoekman et al., 2017; Sallis et al., 2006). The built environment (the third level in the socio-ecological approach) is often considered as a prime aspect in this matter, not least by policymakers. By investing significant resources in sports facilities, policymakers (the fourth level) implicitly assume a causal link between the number of sports participants and the number of users (e.g. Council of Europe, 2001; Limstrand, 2008). Also in Flanders, which is the Northern Dutch-speaking part of Belgium and also the research context of this study, sports policy plans have a prime focus on the provision of sufficient sports facilities.

Initially, the 1970s Flemish sports policy focussed on investments in sports infrastructure, which went hand in hand with the rising sports participation rates (van Poppel et al., 2018). Nevertheless, it is difficult to distinguish between cause and effect, as more demand for sports facilities stimulates governments to build sports infrastructure, which on their turn will further increase sports participation and thus the demand for more sports infrastructure. While it indeed seems evident that a minimum level of sports infrastructure is needed to be able to practice (certain) sports (activities), it is not evident that a maintained focus on building more sports infrastructure results in ever-increasing sports participation rates. Indeed, little empirical evidence is at hand that underpins this supposed (causal) relationship (Limstrand, 2008; Wicker et al., 2009) and the focus of most empirical sports participation studies is on the fact that sports participation is influenced by characteristics of the individual and the direct relations that they have with their significant others (Sallis et al., 2006), i.e. the first and second level of the socio-ecological approach respectively.

The above demonstrates that studies are needed that provide in figures to underpin (or nuance) the facility-participation relationship (Hoekman et al., 2016; Wicker et al., 2013). More particularly, as policymakers believe that more sports infrastructure results into higher sports participation rates, this research aims to give policymakers insight in this relationship, such that they can decide whether their current policy is effective and/or efficient. The socioecological model consists of multiple layers, and if no hard evidence can be found that building (even) more sports infrastructure results in steadily increasing participation rates, policymakers should (also) shift their focus to one of the other three domains of influence (Sallis et al., 2006). This study aimed to further fill this gap in the literature by underpinning the sports participation-sports facilities relationship with hard data. This study focusses on swimming and swimming pools. Swimming is one of the most practised sports in Flanders and is, therefore, impacting the political focus on the provision of facilities in the region. Given the dated infrastructure, substantial governmental investments are needed in the near future (ISB, 2016). The rationale for focussing on swimming (pools) is threefold. *First*, swimming is one of the most practised sports activities in almost every European country, thereby making it an important activity for people to stay physically active through sports. It has been demonstrated that in four out of twelve of the investigated European countries, swimming is the most practised sports activity, while only one country does not have swimming in the top five activities. In Flanders, the popularity of swimming as a sports activity evolved from 8.3% in 1969, over 12.3% in 1989

Q11 and 13.5% in 1999 to 19.2% in 2009 (Authors, XXXX). *Second*, swimming is the most popular sports activity for which a specific facility is needed. Indeed, the more popular sports activities such as running/jogging and cycling, can be practised almost everywhere and thus do not need a specific facility (Wicker et al., 2013). In Flanders, a large proportion of the swimming pools dates back to the first 'boom' in sports infrastructure, i.e. 129 swimming pools in the period between 1968 and 1977 (Van Espen, 2006). This makes that 62% of the Flemish and Brussels municipal swimming pools have been built in this period, infrastructure that is relatively dated. The start of the new millennium, therefore, seems to inaugurate a boost for the building of new swimming pools (ISB, 2016). *Third*, we already mentioned that several studies demonstrated that last decades the increase in sports infrastructure does not go hand in hand with rising participation figures. Also in Flanders, swimming participation among school-aged children declined between 1999 and 2009.

This research focuses on swimming as a sports activity, meaning that this includes both people who go for a swim in a non-organised setting (i.e. the majority of the swimming participants) as people who are enrolled in a swimming club. Multiple data sources with varying power (i.e. number of cases) and detail level (i.e. quality aspects of sports facility demand and supply) will be used to gain detailed insight in the relationship between swimming participation and swimming pools. This study will thus provide policymakers in data about whether they should focus on building (more) swimming pools, or whether they should (also/more) focus on other policy actions.

Literature review

Conceptual model

The socio-ecological model is an adequate conceptual model to evaluate how policy-makers can influence an individual's sports participation (Keenan, 2002). In this model, it is assumed that differences in the behaviour of individuals are closely related to differences in the environment (Bronfenbrenner, 1979). The environment consists of four layers that intervene with each other, namely on a micro, meso, exo and macro-level. On the one end of the spectrum, the micro-level (i.e. first level) consists of the direct relationships of the individual with significant peers, such as family, colleagues and/or friends. On the other end, the macro-level (i.e. the fourth level) is the society as a whole, and in the context of this study, this is Flanders, the major governmental authority in the policy domain that is sports participation. The municipalities and the Flemish Government are responsible for building and maintaining of the sports facilities (i.e. exosystem, the third level). Bernstein and Davis (2014) refer to this level as the 'built environment', including fields as transportation, urban design, green space and land-use patterns.

Q3 Based on this socio-ecological framework, policymakers can use the built environment as a potential enhancer of sports participation. Indeed, regions with more and better sports facilities should score higher participation rates. This is especially the case for sports activities for which specific facilities are needed, such as is certainly the case for swimming. Because a swimming place is a sports facility that is not available in each municipality in Flanders, this leads us to the central research question of this

study, namely whether municipalities with (more/better) swimming pools have higher swimming participation rates compared to municipalities that do not.

Relationship between sports infrastructure and sports participation

As outlined in the above paragraphs, policymakers need to study empirically whether more sports infrastructure (built environment) is related to higher participation rates. The results of previous research are somewhat contradictory.

The review study of Limstrand (2008) demonstrates that physical activity is positively related to the presence of sports facilities (availability as perceived by the respondent) in nine out of the ten studies. Citizens of Stuttgart have a higher chance of being a regular sports participant when more fitness centres and public playground areas are available (Wicker et al., 2009). For Australia (Eime et al., 2017), Hong Kong (Wong et al., 2014), and the United States (Gordon-Larsen et al., 2006) the results were also significant. Regarding swimming pools, a positive correlation is found between perceived availability of swimming pools and sports participation (Chad et al., 2005). Q4 Wicker et al. (2011) used objective parameters in their Munich sports participation study, and they also found that swimming pools positively influence overall sports participation.

Nevertheless, other research indicates that the positive relationship between the availability of sports facilities and participation rates is not always present in the data. Hoekman et al. (2016, 2017), for example, found that the Netherlands' lower sports facility density in rural areas does not result in lower sports participation rates. In their 2016 study, they attribute this finding to the fact that the Netherlands have a dense sports infrastructure supply. The latter is of particular importance for Flanders, as it is also a densely populated region with a dense sports facility supply. This is also shown by the fact that the citizens are satisfied with the provision of sports infrastructure (European Commission, 2014). A second example can be found in the study of Wicker et al. (2013) who find that the availability of gymnastics/dancing rooms and park areas has a negative impact on sports participation. Based on multivariate analysis, Rütten et al. (2000) did not find significant results. Specific to the case of England, the aforementioned study of Sport England (2015) demonstrated a similar evolution for swimming facilities and participation. Based on Danish data, Elmoose-Østerlund and Iversen (2020) did not find a significant association between swimming club participation and swimming hall supply, and this for both children and youngsters.

Different reasons can be thought of for the above mentioned opposing results in the relation between sports facility supply and participation figures. First, there is, of course, the research context, that differs between countries, but also within countries (e.g. rural vs. urban, see also Hoekman et al., 2017). In some countries or regions, sports facility supply is already well developed, thereby only allowing for marginal gains in this matter. Indeed, it does seem logical that the so-called law of diminishing returns also goes for sports facilities and its effect on sports participation rates. In the beginning – when almost no infrastructure was available – building sports infrastructure proved out to be an effective strategy, as demonstrated by van Poppel and colleagues (2018). But at a certain level, the sports facility supply saturates the latent

Figure 1. Number of swimming pools per 10,000 inhabitants in 2014.

demand for sports (see also Houlihan & White, 2002). Second, certain studies use objective data such as registered databases (e.g. Eime et al., 2017; Wicker et al., 2013), while others are based on the subjective perception of the respondents (e.g. Chad et al., 2005; Wong et al., 2014). Third, significant bivariate results often do not hold when other (control) variables are added in multivariate analyses. Fourth, it could be interesting to also specify the facility availability by other proxy variables than just the number of facilities, such as the surface area of specific facilities (e.g. swimming pool). Also, the quality aspects of facilities could provide more insight into the dynamics of the demand-supply relationship.

Swimming pools

In this paragraph, the supply side (swimming pools) is described. On the one hand, Flemish (potential) sports participants and suppliers indicate that (i) a significant part of today's swimming pools is dated, that (ii) there is a shortage of swimming infrastructure (Anciaux, 2004; Steeland et al., 2017) and that (iii) building and maintaining swimming pools is a significant cost for municipalities in Flanders. Estimates of the annual deficits are averages of €500,000 to €700,000 (ISB, 2016). Communities indicate that, in Flanders and along with ice skating centres, swimming pools are the most out-dated infrastructures, as more than one third (37%) of the swimming pools deal with critical shortcomings (Steeland et al., 2017). A large number of swimming pools have been built in the sixties and seventies (129 swimming pools from 1968 to 1977, Van Espen, 2006). Even in 2014, 62% of the Flemish and Brussels municipal swimming owned swimming pools were built in the 1970s. Many of those swimming pool operators are now faced with the fact that the infrastructure is becoming too old.

When it comes to the need for additional infrastructure, swimming pools again score high, only preceded by indoor sports halls and artificial grass fields. Almost 28% of the communities indicate that more swimming pools are needed to meet demands. Combined with the general belief that a better sports facility supply results in higher participation rates (see for example Eime et al., 2017; Nicholson et al., 2011; Wicker et al., 2013), these shortcomings result in a sports policy that focuses on the provision of sufficient sports infrastructure. For the Netherlands, it has been demonstrated that

local governments spend approximately 85% of their sports budget on sports facility-related issues (Hoekman et al., 2014). Also in Flanders (extra) investments in sports infrastructure have been one of the main policy actions by the central and local sports governments in the last two decades, where swimming pools have been one of the main focus (Anciaux, 2004; Muyters, 2009; Weyts, 2019). For example, apart from the yearly option to apply for Flemish sports infrastructure subsidies (€5 million), in 2015 and 2017 additional funding of €20 million was attributed to building swimming pools (Muyters, 2017). The above justifies our research focus on sports infrastructure.

On the other hand, one cannot deny that Flanders is a densely populated region with a dense sports facility supply. This also holds for swimming pools, as almost one out of two municipalities have a swimming facility (see also Figure 1). Moreover, the swimming pool availability is relatively well spread among a large number of municipalities in Flanders. When interpreting Figure 1, one should take in mind that Flanders has a surface of 13,628 km² (Brussels included), corresponding with a maximum height and length of approximately 80 and 220 km respectively. It is nevertheless important to take into account that there are regional differences, e.g. in the province West-Flanders (the left part of the map) 56% of the municipalities have a governmental swimming pool, whereas in Flemish Brabant (the below-centre of the map) this is only 29% (ISB, 2011).

Swimming participation

When looking at the demand side, and as indicated in the introduction, swimming is one of the most practised sports activities in Europe, especially when also participants in a non-club setting are included. In Flanders, swimming is the most popular sports activity among children below twelve years old with more than four out of ten practising the sport (41.6%) in self-organised and/or club setting. It is also the most popular sports activity for youngsters aged twelve to eighteen (26.3%) (Authors, XXXX). When looking at adults, swimming is less popular both in relative (fifth place) and in absolute (7.4% of the total population) figures. Swimming has always been relatively popular since 1969, and last decades the rise in swimming participation figures is much lower when compared to sports activities such as running and cycling.

Nevertheless, sports participation rates alone are not sufficient to indicate the popularity of swimming (Authors, XXXX). They argue that participation rates are a rough proxy variable to indicate 'the amount of sports' that is consumed, as sports participation frequency and the time spent on sports should also be included. In Flanders, adults that took part in self-organised and/or club swimming, practise their sport on average 0.9 times a week and this for 83 minutes (1.38 hours). To meet health standards, the frequency and number of minutes are also important and thus should be included in this study.

Research hypotheses

Based on the socio-ecological model and general belief (also by policymakers), one would expect that in municipalities with more and/or better swimming pools,

swimming participation figures are higher. Given the high costs of swimming pools, it is important and relevant for policy purposes to investigate whether this relationship between supply and demand can be shown, by testing the following hypotheses:

Hypothesis 1a: the probability of taking part in swimming is positively related to swimming pool availability

Hypothesis 1b: swimming frequency (per swimming participant) is positively related to swimming pool availability

Of course, not all swimming pools are the same, since they differ from each other in specific quality aspects. Therefore, the second part of the research focuses on quality aspects, by investigating whether the ownership structure, the age of the facilities, the entrance fee, etc. influence swimming participation. The quantitative and quality aspects that are investigated depend on the availability of the characteristics in the databases that are used in this study. Until now, little literature has focussed on the relationship between quality parameters of sports infrastructure and sports participation. Reimers et al. (2014) acknowledged the limitation of not including quality parameters in sports infrastructure-participation research. The Flemish Government's policy also focuses on these quality aspects, as the chance of receiving subsidies for building sports infrastructure depends on quality aspects, such as – amongst others – the combination with clusters of other sports infrastructure and the number of visitors and the distances they travel to the swimming pool (Flemish Government, 2017). Based on the above we expect the following relationship:

Hypothesis 2a: the probability of taking part in swimming is related to quality aspects of the available swimming pools (building year, cafeteria, etc.)

Hypothesis 2b: the swimming frequency (per swimming participant) is related to the quality aspects of the available swimming pools (building year, cafeteria, etc.)

Finally, additional insights about the aspects of quantity and quality that determine the attractiveness of swimming pools towards citizens can be gained by investigating the supply side. The advantage of these figures is that it is possible to investigate the same hypotheses from a different point of view:

Hypothesis 3: the number of visits to swimming pools is positively influenced by aspects of quality of the swimming pool (lower entrance fee, price reduction, number of opening days).

Materials and methods

Data

To test the aforementioned hypotheses, a number of data sources are used. The datasets contain data of Flanders, the Dutch-speaking part of Belgium and the research context of the study. The Flemish (and not the Belgian) government is the competent authority for sports. In 2014, Flanders had a population of 6,404,715 (population density of 478 inhabitants per square kilometre), distributed over 308 municipalities (i.e. 20,794 inhabitants per municipality) (IBZ, 2019). A quarter of the Flemish municipalities

Table 1. Prevalence (percentage of municipalities that have at least one swimming facility) and total amount of the number of swimming facilities in Flanders in 2009 and 2014 ($N=308$).

	Prevalence (in %)		<i>N</i> or mean	
	2009	2014	2009	2014
Lakes	7.8	8.2	34 (<i>N</i>)	34 (<i>N</i>)
Indoor swimming pool	30.8	32.5	118 (<i>N</i>)	121 (<i>N</i>)
Outdoor swimming pool	15.9	17.1	65 (<i>N</i>)	67 (<i>N</i>)
Other swimming facilities	4.9	5.25	15 (<i>N</i>)	17 (<i>N</i>)
Swimming pool surface (m ²)	/	/	296,4 (mean)	294.6 (mean)
Ownership facilities	/	/	Private/commercial (27%) – municipality (54%) – governmental (higher level) (6%) – school (13%)	Private/commercial (27%) – municipality (54%) – governmental (higher level) (6%) – school (13%)
Age of the most recent swimming pool (year)	/	/	15,7 (mean)	16,0(mean)
Cafeteria	84.2	84.2	235 (<i>N</i>)	243 (<i>N</i>)

has less than 10,000 inhabitants. Only two Flemish cities have more than 200,000 residents (VMSG, 2015).

For the sports facility data (exo level), a database of the Flemish Government (Sports Flanders) is used (D1). This dataset includes all sports facilities in Flanders, and this for a wide range of characteristics. Table 1 gives an overview of the descriptive statistics of this dataset, i.e. the prevalence (what percentage of the 308 municipalities in Flanders has a specific facility), and the number of facilities in Flanders. The logarithm of the number of inhabitants of each municipality is included in the dataset. Other variables that are used are the number of lakes, indoor and outdoor swimming pools and other swimming facilities. The swimming surface is the total amount of swimming pool surface area.

For the sports participation figures (micro-level), the most recent accessible version of two large-scale representative survey datasets are used. For children, the Flemish Household Study on Sports Participation is used (D2, RR = 68%; Authors, XXXX). The dataset consists of 2920 school-aged children who answered a list of detailed sports participation questions about the previous year. For the adults, the Participation Survey Flanders is used, containing the answers of 3781 respondents (D2-3; RR = 58%; Authors, XXXX). An important advantage of these studies is that they use the same definition for swimming sport participation, i.e. taking part in swimming during spare time at least once in the past year. Swimming is considered relatively broad, and activities such as water polo and water ballet, although they have not been practised a lot by the respondents relative to 'swimming', have been included. Moreover, all contexts (organised as well as self-organized) and both competitive and recreational swimming has been accounted for. The focus is thus on swimming as a sports activity and as indicated above also swimming for recreational purposes is considered sports, but obliged swimming during physical education at school and visits to swimming pools for wellness purposes (e.g. wellness) are not included.

Table 2. Descriptive statistics of the swimming pool survey by ISB in Flanders in 2014/2015 ($N=125$).

	Frequencies	Mean (SD)
Swimming pool for recreational purposes	Yes (50.4%) – No (49.6%)	
Makes part of a bigger sport complex	Yes (38.4%) – No (61.6%)	
Swimming surface (m ²)		565.24 (597.51)
Indoor basins		2.35 (1.74)
Outdoor basins		0.43 (0.94)
Organisation	Commercial/private ^a (25.4%) – municipality (41.8%) – governmental (higher level) (11.9%) – non-profit organisation ^b (8.2%) – other (3.7%)	
Opening days		292.36 (85.13)
Fee for inhabitant (30 years old) (in €)		2.67 (1.13)
Reduction (in %)		15.27% (21.4%)

^aOnly swimming pools with (some) government involvement were included. ^bIn this context this are non-profit organisations with a direct link to a local authority (a kind of external independent agency of the municipality).

Third, a dataset of the Flemish Institute of Sport Management and Recreation Policy (ISB) is used (D4; exo level, Table 2). The ISB is the sector organisation of sports policy for local municipalities (and their swimming pools). In 2014/2015 ISB surveyed (at least partially) governmental swimming pools, in which the respondents had to report quality and quantity features ($N=125$; $RR=77\%$). Nevertheless, it is important to take in mind that with the latter data set, and opposite to the former data sets, it is not possible to distinguish between visitors who use the swimming pool for sports versus wellness (e.g. whirlpool) purposes.

Method

$H1$ and $H2$ are evaluated by analyses on the level of the individual/citizen. Data from Tables 1 and 3 are used, meaning the sports facilities database (D1), the Flemish Household Study (D2) on Sports and the Participation Survey Flanders (D3). In a first phase, bivariate statistics are used to evaluate whether the availability of swimming facilities in a municipality is positively related to the probability of swimming (chi-square) and/or to the swimming frequency (unpaired t-test). In a second phase, a multivariate hurdle model is used to test which quality variables influence the probability to take part in swimming, and the swimming frequency. A zero-regression method is applied, given that a large proportion of the dependent variable are zeros, meaning that an OLS-regression would lead to biased results (Eakins, 2018; Wooldridge, 2016). For the present data, a log-normal hurdle model is opted for, as it considers swimming participation as a two-part decision: first people decide whether they will take part in swimming or not, second, they decide how many times they will swim.

Third, the ISB dataset (D4) will be used to investigate which factors determine the number of visits in a swimming pool ($H3$), and should thus be situated at the organisational level (swimming pool). As there are no zeros in the dependent variable (every swimming pool has at least some visits), OLS regression is applied.

Table 3. Descriptive statistics (mean/frequency) of the Flemish Household Study on Sports (2009; $N=2920$) and the Participation Survey Flanders (2014; $N=3781$).

	Children	Adults
Swimming participation	18.99%	10.10%
Swimming frequency (number of times a year)	5.71	4.24
Sex	Male (49.93%) – female (50.07%)	Male (49.81) – female (50.19%)
Age	12.38 year	47.30 year
Education (on a scale of 4) ^a	3.22	2.60
Number of family members	4.26	2.83

^aFor the children, the educational level of their parents is used.

Results

Children and adults who live in a city with a swimming pool or a swimming lake do not have a higher probability to swim (Table 4, *H1a*). Regarding the swimming frequency (*H1b*), children that live in a city with a swimming pool swim more often (6.8 times a year) than children who live in a city without a swimming pool (5.2 times a year).

Table 5 answers the same hypotheses (*H1a* and *H1b*), although this time also infra-structural quality variables (*H2a* and *H2b*) and demographic variables have been added as independent variables. Remarkably, the demographic variables have a significant impact on adults' swimming, but almost no impact on children's swimming (except for education on the swimming frequency). The multivariate analysis confirms the findings in Table 1 that children that live in a municipality with a swimming pool swim more frequently. The quality aspects of swimming pool facilities do not seem to influence swimming participation very much, except for the positive impact that private swimming pools have on the swimming frequency by children.

In contrast to the previous tables, Table 6 provides results based on supply data, to test the relationship between swimming pool characteristics (quality) and the number of visitors from another perspective, i.e. from the organisation's point of view instead of the individual's. The results indicate that recreation pools have more visits, and the number of opening days also has a positive impact on the number of visits.

Discussion

For policymakers, it is essential to gain more insight into the effects of sports facilities on sports participation. The above results provide some interesting insights into the supply-demand relationship for swimming and will be discussed in more detail in the following sections.

First of all, based on the combined results of Tables 4 and 5, it is clear that the availability of a swimming pool in the municipality does not have a significant impact on the probability that inhabitants of that municipality went swimming during the last year. This conclusion holds for both children, and adults, and also goes for other swimming infrastructures such as outdoor swimming pools and swimming lake. When looking at the swimming frequency, the bivariate (Table 4) and the multivariate (Table 5) results are in line with each other, namely that swimming frequency is positively influenced by the presence of a swimming pool in the municipality. Nevertheless, this significant result only holds for children, and not for adults. A possible explanation is

Table 4. Bivariate statistics of the average swimming participation and swimming frequency in the past year for children ($N=3097$, in 2009) and adults ($N=4040$, in 2014) who do or do not have swimming facilities in the Flemish city they live in.

Independent variables	Children (6–18 years)	Adults (>18y)
Dependent variable: Swimming participation (Yes–No) (in %)		
Lake or not		
Yes	16.2	10.2
No	19.3	9.3
Sign.	NS	NS
Indoor swimming pool		
Yes	19.8	9.6
No	18.6	11.1
Sign.	NS	NS
Outdoor swimming pool		
Yes	21.3	10.3
No	18.4	10.0
Sign.	NS	NS
Dependent variable: Swimming frequency (times a year)		
Lake or not		
Yes	5.0	3.7
No	5.8	4.3
Sign.	NS	NS
Swimming pool indoor		
Yes	6.8	4.3
No	5.2	4.2
Sign.	*	NS
Swimming pool outdoor		
Yes	5.9	4.4
No	5.7	4.2
Sign.	NS	NS

Table 5. Double hurdle of the decision to swim (yes–no) and the swimming frequency for children ($N=1,944$) and adults ($N=3,707$).

Independent variables		Dependent Variable			
		Children		Adults	
		Y/N	Frequency	Y/N	Frequency
Log (number of inhabitants)		0.06	0.50	0.02	0.49
Lakes	Number	–0.08	2.54	–0.20	–0.86
Swimming pool indoor	Number	0.13	2.22*	–0.01	–0.36
Swimming pool outdoor	Number	0.08	1.51	–0.10	0.05
Other swimming facilities	Number	–0.08	–1.74	0.11	2.08
Swimming surface	m ²	–0.01	0.01	0.01	0.01
Unicity	Number	–0.01	–0.27	–0.01	0.07
Ownership (school = ref.)	Commercial/private	0.16	4.02*	–0.05	1.19
	Municipality	0.18	4.62	0.08	1.16
	Governmental (higher level)	0.03	–3.85	0.22	0.71
Age of facilities	In years	0.01	–0.05	–0.01	–0.03
Cafeteria	Amount	–0.11	–2.83*	0.06	–0.75
Age	Year	–0.13	–0.65	–0.01***	–0.04*
Sex (male = ref.)		–0.05	–0.72	–0.36***	–2.18***
Education		0.05	1.27*	0.09***	0.64*
Family members	Number	–0.08	–0.69	0.05*	0.11
Control: swimming pool at home (no = ref.)		/	30.49	/	71.1***

that parents' opinion is that swimming once in a while provides their children with an important life skill, and the availability strengthens the option of doing it on a more regular basis. The number of inhabitants is positively related to the number of visitors

Table 6. OLS regression with the number of visits of swimming pools ($N=111$) as the dependent variable.

Independent variables			Dependent variable: number of visits
Log(number of inhabitants)			26,266.32***
Recreation pool (No = ref.)	Yes		-3,744.70
Part of bigger a sport complex (No = ref.)	Yes		6,803.12
Swimming surface	m ²		17.32*
Indoor swimming basin	Number		2,931.13
Outdoor swimming basin	Number		-7,179.27
Organisation (Municipality = ref.)	Non-profit organisation		16,964.82
	Commercial/private		636.20
	Governmental (higher level)		210.81
	Other		3834.10
Opening days	Number		131.17**
Fee for inhabitant (30 years old)	In €		1,030.254
Reduction	In %		54.09

in Table 5. It is expected that this is since they have more potential visitors, but also because the swimming pool will be designed for a bigger number of visitors.

The results thus indicate that the relationship between swimming pool availability and swimming participation (*H1a* and *H1b*) is not that convincing. A possible explanation can be found in the research of Hoekman et al. (2016) and Ruseski et al. (2011), who found that travel distance is positively related to participation. They attribute this finding to the fact that the sports facility supply is relatively well-developed in their research sample. The same conclusion could therefore also hold for Flanders, i.e. when sufficient sports facility supply is at hand, citizens' willingness to travel surpasses the actual distance towards the infrastructure. As citizens in Flanders indicate that they are satisfied with the dense sports facility supply (European Commission, 2014), it seems that this rationale also holds for Flanders. Indeed, municipalities are relatively small, and 207 of the 308 municipalities have a swimming facility. Thereby, even if there are no swimming facilities in their municipality, citizens do not have to go too far for swimming purposes. In other words, the majority of the Flemish inhabitants can be expected to have a swimming pool at a relatively close distance, such that the results of this study suggest that building even more swimming pools would not lead to higher swimming participation and frequency.

Second, the children's sports participation is almost not influenced by sociodemographic and socioeconomic variables, except that children of parents with longer education swim more frequently. When adults are considered, swimming is socially stratified. Female adults that are older and have had a shorter education, have a lower swimming probability and swimming frequency. Although individual factors are difficult or almost impossible to change (Wicker et al., 2009), these variables are of particular importance for policymakers. Building and maintenance of swimming pools are almost always (partially) financed with public funding, and therefore one could argue that the majority of the public funding of swimming pools is used by the people who need it least (i.e. Matthew effect). The Flemish Government already developed certain actions such as the so-called 'UIT' visitor card to offer citizens who have a lower level of income to take part in leisure activities at a reduced fee, and in 2018 33 swimming pools took part in this initiative (UiTPAS, 2018). Policymakers could use this instrument, and/or take extra initiatives to remove the aforementioned thresholds.

Based on the results of [Table 5](#), the quality of the swimming facility has a very small significance on swimming participation and swimming frequency, as is the case for the building year and most of the ownership structure of the facilities. The only positive significant result is that children swim more frequently in swimming facilities built and exploited by commercial/private compared to when a swimming pool owned by a school is available. The latter is in line with the efficiency argument that is often used in favour of the private sector, as it is believed that the involvement of a private partner often results in a financial, operational and/or social advantage (Besley & Ghatak, 2001; Theirssen et al., 2018; Wojewnik-Filipkowska & Trojanowski, 2013). Nevertheless, further analyses also indicate that no difference in performance can be found between municipality swimming pools and commercial/private ones. This finding can thus be taken in mind, when deciding whether policymakers should include a private partner, i.e. setting up a public-private partnership (PPP) or not. The rationale for combining public and private partners is that it combines the advantages of governmental funding and private expertise and flexibility (Iossa & Martimort, 2015; Wojewnik-Filipkowska & Trojanowski, 2013), and in practice, its success in Flanders can be deduced from the fact that PPP has increasingly been used in Flanders over the past ten years. Nevertheless, as the commercial sector also tends to fail, the government should correct for these market failures (Cochran & Malone, 2005), and therefore both in theory and in practice (in the PPP swimming pools built in Flanders), the following facts have to be taken in mind. First, the private sector focuses on making a profit, and a higher entrance fee could lead to an underrepresentation of certain groups in swimming participation (Gratton & Taylor, 2000), the government should monitor that involving a private partner does not result in a Matthew effect. This is why in public-private partnership the public partner – in return for subsidies – records clear agreements about the price setting or do the reservations for schools, sports clubs, etc. in specific time slots themselves. Second, we should take in mind that this kind of swimming pools often have more recreational facilities, as private partner's consumer responsiveness is higher when compared to public authorities for which swimming pool management is a non-core service (Cools et al., 2011). Nevertheless, policymakers should be aware that their subsidies are mainly used for increasing swimming as a sports (and thus a health-enhancing, physical) activity, and not to the provision of more and/or cheaper saunas and whirlpools. Third, the consensus is that building and exploiting a swimming pool is (almost) impossible without partial funding by the government (see for example Muyters, 2009). Moreover, Vekeman and colleagues (2013) found that the perceived benefits of Flemish citizens (both swimmers and non-swimmers) for swimming pools is €56.6 exceed the total of €51.8 million of public funding, thereby indicating that public investments in swimming infrastructure have a positive impact on people's welfare. This is especially the case when hidden externalities are also considered, as Dallmeyer et al. (2017) indicate that public expenditure on swimming pools results in higher participation rates in physical activity.

The results of [Table 6](#) add additional insight into the factors that determine swimming participation. The difference is that in this table, the research question is investigated from the point of view of swimming pools (the supply side), instead of the

citizens' one (demand side). Therefore, it is not possible to distinguish the participation decision from the frequency decision, as the variable represents a combination of both, nor is it possible to distinguish between swimming as a sports activity versus visits for recreational non-sport purposes (e.g. for sauna, whirlpool). Although in line with expectations, it is interesting to notice that swimming pools that are located in municipalities with more inhabitants, attract more visitors. This means that in bigger cities, swimming pools attract more visitors, also when corrected for swimming surface and the number of swimming pools. The finding that bigger swimming areas result in more visitors, is also in line with expectations. Swimming pools that are open for more days, attract more visitors. Nevertheless, increasing the number of opening days is not always straightforward in practice. This again could plead for the involvement of a commercial/private partner when exploiting a swimming pool, as in their sector economic goals are more predominant so the number of closing days for maintenance is limited to the minimum and the opening hours are stretched to the maximum. Commercial/private partners also take into account whether and which opening days are profitable, thereby bringing an economic logic into exploiting a swimming pool. Combining the strengths of public and private partners into a PPS could, therefore, be an interesting option for consideration (Iossa & Martimort, 2015).

Among the non-significant results, a first remarkable finding is the non-existing effect of the entrance fee. Indeed, the fee is an important aspect for most swimming pool visitors, as the literature demonstrates that the majority of swimming participation and swimming pool visits take place in a non-organised setting (Authors, XXXX; XXXX; ISB, 2016). Additional analyses demonstrate that a higher fee is positively related to a higher number of visits, but when the quality and quantity variables are added, the former bivariate effect disappears. A higher fee means more swimming surface, more swimming basins, more recreational facilities, etc., meaning that visitors do not look at the absolute entrance fee, but more at the value for money. It could, therefore, be interesting to add more quantity and quality parameters based on an even more detailed dataset, to compare the entrance fee of swimming pools. A second interesting non-significant relation is the one between the number of visits on the one hand and the price reduction that certain swimming pools give to the citizens of the municipality that they are located in on the other hand. This finding seems to suggest that (increasing) price reduction to local citizens is not decisive in raising swimming participation. The rationale for these reductions is not only to have 'social entrance fees', but it is also about the local taxes that inhabitants of a municipality with a swimming pool pay. The local taxes are used to pay the deficit of the exploitation of the swimming pool. Non-residential visitors do not pay taxes and therefore the residential visitors receive a reduction so that they do not pay twice. Overall, based on the results of this study, no support is found that municipalities who invest money in a swimming pool raise swimming participation among their citizens (even when discounts are granted). A possible explanation about the non-existing relation between entrance fee and swimming participation can be found in the fact that swimming pool entrance fees are relatively cheap in Flanders, with a maximum of €8.40 for non-residents (see also Table 2 for the descriptive statistics). These inexpensive income fees make that there are possibly other barriers for swimming, as already

demonstrated by the significance of the sociodemographic and socioeconomic variables in Table 5.

Conclusion

In conclusion, it is found that children swim more frequently when there is a swimming pool in the municipality. But, maybe more important, for the participation decision (children and adults) and the swimming frequency (adults), no significance was found for the infrastructural variables. This is remarkable given the large public investments in sports facilities (i.e. swimming pools). A possible explanation could be the dense network of swimming facilities (see also Hoekman et al., 2016) in Flanders, meaning that at the moment sufficient swimming facilities are available to provide swimming access to a large proportion of the population.

This paper does not provide evidence that the policy of further providing more infrastructure will turn out to be very effective. Also, other policy actions as price reductions, the ownership structure (private or governmental) and the overall providing of swimming facilities seemingly do not add very much to the (swimming) participation figures. This is an interesting conclusion, as it indicates that sports policy should focus on alternative strategies to further increase swimming participation (and sports participation) and that purposeful policy actions are needed to make swimming accessible to all population segments (women, elderly, longer education). This is especially the case as previous research has demonstrated that these groups are underrepresented in overall sports participation (Authors, XXXX; XXXX). Therefore, to increase swimming (sports) participation, and when a certain (minimum) level of swimming pool infrastructure is available, policymakers should also/mainly focus on other levels of the socio-ecological approach than the built environment, as they are possibly more cost-efficient than building expensive sports infrastructure.

A limitation of this study is that it – of course – does not describe causal relationships. For example, the correlation between swimming pool supply and swimming frequency throughout the years suggests that the governmental infrastructural policy of the previous decades made swimming very popular and accessible (see also Van Espen, 2006), but that at the moment no big leap forward can be made by investing (even) more public money in additional swimming facilities. Therefore, future research should also include variables like whether the infrastructure is up-to-date or not, and whether the perceived quality of the infrastructure suffices. A second limitation is the geographical detail level of the respondents, of which only the postal code is known. With exact geographical location data, it would be possible to calculate the distance (or travel time) towards the closest swimming pool. By focussing on geo-located data, the chances of finding significant results would be higher (van Renswouw et al., 2016). Third, as is the case with most of the socio-scientific research, the operationalisation of the variables (e.g. swimming participation, swimming pool availability) differs between studies, which one should take into consideration when comparing the results of different studies. Finally, future research could also focus on other swimming pool success factors (apart from the number of visitors), such as revenues or participation rates

among target groups. Also, other quality variables (i.e. the design of swimming pool) could result in additional insights.

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ORCID

Erik Thibaut <http://orcid.org/0000-0002-5831-6433>

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