

Health Surveillance Indicators: What is Available in European Data Sets for Policy Evaluation?

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Abstract

Background: Policies targeting diets and physical activity have been proposed as mechanisms for the prevention and control non communicable diseases in Europe. While these actions have the potential to improve health at a population level, the impact of these policies in Europe is currently unknown. The aim of this study, as part of the wider Policy Evaluation Network, is to catalogue the data currently available for policy evaluation in Europe to inform the development of surveillance instruments. The catalogues will also provide an opportunity for key stakeholders to view the available EU indicators that can be employed to evaluate policies which influence diet, physical activity and sedentary behaviour.

Methods: A suite of key indicators was agreed by PEN members and over 30 EU experts during a workshop in September 2019. Next, variables in existing EU monitoring systems were suggested by workshop participants for the measurement of each key indicator. The mapping process involved an evaluation of how suitable the suggested variables were as measures for the indicators. This was done using a Likert scale (matched, somewhat matched, less matched, not matched).

Results: The suite of key indicators included both behaviour outcome indicators and upstream indicators relating to diet (n=72) and physical activity and sedentary behaviour (n=67). 72% of diet indicators and 86% of physical activity and sedentary behaviour indicators were matched to at least one variable in an existing EU monitoring system. The majority of indicator-measure pairs were categorised as 'matched' on the Likert scale.

Conclusions: While there are gaps in the measurement of policy level indicators in domains such as inequality, funding and resources and governance, the majority of key policy indicators were mapped to measures in existing systems. Therefore, much of the data for evaluation of policies is readily available.

Background

Non-communicable diseases (NCDs) including cardiovascular diseases, cancers, diabetes and chronic respiratory diseases represent a major threat to the health and well-being of populations globally. According to the Global Burden of Disease study (2017) (1), in Europe over 91% of deaths and almost 87% of Disability adjusted life years (DALYs) are attributable to NCDs.

The aetiology of NCDs is complex. Modifiable causes at an individual level, for example diet and physical activity behaviours (2), are heavily driven by networks of interrelated upstream determinants or 'causes of causes' (3). These networks, referred to as a person's food environment and physical activity environment include physical, economic, policy and social surroundings, all of which shape a person's lifestyle in terms of diet and physical activity. Addressing the 'causes of causes' requires a system level approach that targets individual behaviours, the environments in which they live and the policies which can influence both (4, 5).

Policies targeting diets and physical activity have been proposed as mechanisms for the prevention and control of NCDs in Europe (6). While these actions have the potential to improve health at a population level, the impact of these policies in Europe is currently unknown (7).

A study examining the implementation of the WHO Food and Nutrition Action Plan 2015–2020 (WHO FNAP) in EU member states using data from the 2016 WHO Global Nutrition Policy Review (WHO-GNPR) identified a continuing need for robust and harmonised monitoring data in the region (8). While progress has been made in certain policy areas, including school nutrition policies and trans-fat regulations, the authors recognised a need for more ambitious policies in order to achieve the global NCD targets. In order to plan, implement and evaluate these ambitious policies however, good quality data on both health outcomes and determinants is a requirement (4). Collation of this data that allows for comparability across Europe requires harmonised public health surveillance systems. Two key components of harmonised surveillance are a list of indicators common to member states and monitoring and surveillance tools to measure these indicators (9).

A list of key indicators for diet, physical activity (PA) and sedentary behaviour (SB) was developed by the Policy Evaluation Network (PEN) researchers through an iterative process (10). These indicators were adapted from previously published frameworks including the Food-Environment Policy Index (Food-EPI) (4), Nourishing framework (11), The Policy framework for Healthy and Equitable Eating (HE²) (12) and the Determinants Of Nutrition and Eating (DONE) framework (13) for diet indicators and the WHO Health Enhancing Physical Activity Audit Tool (HEPA-PAT) (5), MOVING (14) and WHO Global Action Plan on Physical Activity 2018–2030 (WHO GAPP) (15) for PA/SB indicators. They were then prioritised by over 30 EU experts and PEN members during a workshop in September 2019. The prioritisation (described by Garnica Rosas et al. in a corresponding paper (10)) resulted in a final suite of key indicators including 72 diet related indicators, and 67 PA/SB indicators. The indicators are grouped according to five levels of the determinants of health: policy, environmental, interpersonal and individual level determinants and behavioural outcomes.

The first objective of this research was to identify which indicators were already in operation within existing European systems. The second objective was to provide two catalogues (one for diet and one for PA/SB) that included all the indicators and where and how these indicators were measured. Access to these catalogues will provide an opportunity for key stakeholders to view the available EU indicators that can be employed to evaluate national level public and private policy actions which influence diet, physical activity and sedentary behaviour. For the purpose of this work, policies are defined as *'decisions, plans and actions that are enforced by national or regional governments or their agencies (including at the local level) which may directly or indirectly achieve specific health goals within a society'* (7).

The development of this catalogue presents the first steps in establishing the roadmap toward a harmonisation of monitoring and surveillance indicators across Europe to facilitate the evaluation of policy impact. To this end, PEN members are developing surveillance instruments and a study protocol for measuring a set of key policy indicators. By mapping the key indicators to variables in existing pan-

European monitoring and surveillance systems we aim to document the data currently available for policy evaluation in Europe and to identify gaps in health surveillance. This information will feed into the development of the PEN surveillance instruments and ultimately ensure assessment of aligned indicators for policy, determinants and behaviour and health outcome indicators across Europe.

This paper describes the methodology used to map the suite of key indicators for diet, physical activity and sedentary behaviour to existing Pan-European monitoring systems and documents the data currently available for policy evaluation.

Methods

For the purpose of this study, indicators were defined as specific, observable and measurable characteristics of changes that demonstrate progress towards outcome or impact (16).

The indicator mapping process was carried out in two steps outlined in **Fig. 1**: 1) the collection of variables from existing EU monitoring systems that might serve as indicator measures; 2) an evaluation of how suitable the suggested variables were as measures for the indicators.

Figure 1. The process used to map key indicators for diet, physical activity and sedentary behaviour to existing pan European monitoring systems.

Information on existing EU monitoring systems was provided by the PEN members and EU experts who attended a prioritisation workshop in September 2019. These experts included researchers based in academic institutions, policy makers and representatives of Pan-European research projects such as Science and Technology in childhood Obesity Policy (STOP) (17) and Confronting Obesity: Co-creating policy with youth (CO-CREATE) (18) and EU surveillance initiatives such as WHO Childhood Obesity Surveillance Initiative (COSI) (19) and European Health Interview Survey (EHIS) (20). Experts were asked to suggest EU monitoring systems that might provide a measure for each indicator. This data was gathered via a questionnaire that also collected information on the availability of data and survey questionnaires for each monitoring system. Using this information, variables were gathered from each suggested monitoring system that could feasibly measure the indicators. Some indicators were mapped to multiple variables from different monitoring systems, covering different age groups or regions.

Step two in the mapping process involved evaluating the suitability of each suggested variable as an indicator measure. To carry out this evaluation we developed a Likert scale to judge how well matched a variable was to an indicator. The scale included 4 points, matched, somewhat matched, less matched and not matched. Definitions of each scale point are detailed in **Fig. 1**. Categorisation for each indicator was carried out initially by individual PEN researchers (IS and ANP). Secondary checks and evaluations were carried out by PEN members with diet and physical activity expertise.

The final mapped indicators and monitoring systems were then collated into a catalogue format and will be published on the PEN website (21) using the data visualisation platform Infogram (22). This will allow

for the catalogue to be accessible to stakeholders.

Results

Description of monitoring and surveillance systems currently measuring key policy indicators.

Indicators were matched to variables in 17 different monitoring and surveillance systems and databases (**Table 1**). Eleven of these are managed by an EU body, such as Eurostat or the European Commission, four are managed by the WHO and five are managed by non-governmental organisations, academic institutes or foundations.

Monitoring system/database	Organisation
Childhood Obesity Surveillance Initiative (COSI)	WHO Regional Office for Europe
EPHA policy mapping	European Public Health Alliance
European Injury Data Base	The European Commission
EEA-Indicators: European Air Quality Index	European Environment Agency
EFSA Food composition database	European Food Safety Authority
European Health Interview Survey (EHIS)	Eurostat
Eurobarometer 88.4	The European Commission
European social survey (ESS)	European Research Infrastructure Consortium (ERIC)
European Union Statistics on Income and Living Conditions (EU-SILC)	Eurostat
Eurostat Food Price Monitoring Tool	Eurostat
Global dietary database	Tufts Friedman School of Nutrition Science and Policy
Health Behaviour in School-aged Children Survey (HSBC)	WHO Regional Office for Europe
HEPA PAT	WHO Regional Office for Europe
OpenStreetMap	OpenStreetMap Foundation (OSMF)
Special Eurobarometer 472: Sport and physical activity	The European Commission
Survey of Health, Ageing and Retirement in Europe (SHARE)	European Research Infrastructure Consortium (ERIC)
WHO Global Nutrition Policy Review	World Health Organisation

Table 1. Monitoring and surveillance systems and databases that provided variable matches for the key policy indicators

Summary of key indicators mapped to existing monitoring and surveillance systems

Measures within existing EU monitoring systems were found for 72% of diet indicators and 86% of physical activity and sedentary behaviour indicators (**Table 2**). Indicators at the individual level (individual determinants and behaviour outcomes) were well covered by existing monitoring systems. For the diet indicators, 80% of individual determinant indicators and 73% of behaviour outcome indicators were matched with a suggested variable. Potential variables were suggested for 85% of PA/SB behaviour outcome indicators. At policy level, 84% of PA/SB indicators and 70% of diet

indicators were mapped to existing measures.

Table 2. Summary of indicators that were matched to variables in existing monitoring and surveillance systems

Level	Diet indicators		Physical activity and sedentary behaviour indicators	
	Matched	Not matched	Matched	Not matched
	n(%)	n(%)	n(%)	n(%)
Policy	26 (70)	11 (30)	27 (84)	5 (16)
Determinants (Environmental)	7 (64)	4 (36)	14 (100)	0 (0)
Determinants (Interpersonal)	2 (67)	1 (33)	6 (75)	2 (25)
Determinants (Individual)	8 (80)	2 (20)	0 (0)	0 (0)
Behaviour outcomes	9 (82)	2 (18)	11 (85)	2 (15)
Total	52 (72)	20 (28)	57 (86)	9 (14)

Assessing the suitability of suggested variables as indicator measures using a Likert scale

Measures that were matched to indicators in the initial mapping stage were assessed for suitability using a Likert scale (not matched, less matched, somewhat matched, matched). Examples of matched indicator-measure pairs at each Likert scale point are given in **Table 3**.

58% of diet indicator-measure pairs and 80% of PA/SB indicator-measure pairs were classified as 'matched' on the Likert scale (i.e. the variable was very suitable for measuring the indicator). The 'less

matched' scale point had the least indicator-measure pairs for both diet and PA/SB, 11% and 7% respectively.

Table 3. Examples of PEN key indicators matched at each level of the Likert scale.

Diet indicators		
Likert scale point	Key indicator	Matched variable in EU monitoring/surveillance system
Matched	Fruit intake, portions per day	EHIS Number of portions of fruit a day, excluding juice
Somewhat matched	Sugar-sweetened beverages, glasses per day	COSI, Family Survey Over a typical or usual week, how often does your child eat or drink the following kinds of food/beverages? Soft drinks containing sugar · Never · <1 per week, some days (1-3), · Most days (4-6), · Every day
Less matched	Food and nutrition insecurity	EU SILC, Capacity to afford a meal with meat, chicken, fish (or vegetarian equivalent) every second day
Physical activity and sedentary behaviour indicators		
Matched	Availability of indoor activity space in school	COSI School record form (mandatory) Does your school have an indoor gym? · Yes · No
Somewhat matched	Time spent with aerobic physical activity in a typical week.	EHIS During the past 7 days, on how many days did you do moderate physical activities? Days per week
Less matched	Condition of active commuting infrastructure to and from kindergarten/school/university/work	COSI Family Survey (voluntary) If your child doesn't walk or ride a bicycle, skateboard or non-motorized scooter from home to school or vice versa, please indicate the reason(s): · the route is not safe · the school is too far from home · the child does enough physical activity during the day · lack of time

· other (Specify: _____)

Abbreviations : EHIS, European Health Interview Survey; COSI, Childhood Obesity Surveillance Initiative; EU SILC, European Union Statistics on Income and Living Conditions; HBSC, Health Behaviour in School-aged Children Survey (HSBC).

Indicators that were not matched

At the end of the mapping process, 28% of diet indicators and 14% of PA/SB indicators were not matched with variables in existing monitoring and surveillance systems.

Indicators at policy level made up 55% of unmatched diet indicators. These indicators came under the policy domains of 'Funding and Resources', 'Inequality', 'Governance', 'Monitoring and Evaluation' and 'Retail' (**Table 4**). The remaining 45% of unmatched indicators were spread equally across determinants (environmental, interpersonal and individual) and behaviour outcomes. These indicators covered a wide range of domains including environmental food availability and accessibility, portion size, household food literacy level, food beliefs, minority group specific indicators and situational and time constraints.

PA/SB indicators that were not matched were spread evenly across the indicator levels (**Table 4**). At policy level, unmatched indicators were related to 'Active Environments' including government support for urban design, public transport and road safety and financial incentives for PA promotion under the Active Societies domain. These indicators were adapted from the MOVING framework (14) and WHO GAPP(15). At the determinants and behaviour outcome levels, unmatched indicators covered the availability and accessibility of activity spaces, specifically in the kindergarten, university and workplace setting. School setting indicators were matched with variables in the WHO COSI (19) and in Health Behaviour in School-aged Children Survey (HSBC)(23). Other indicators that were unmatched included those relating to supportive behaviour by friends and parents, non-organised sports participation and PA in the kindergarten setting.

Table 4. PEN key diet indicators that are not currently available in EU monitoring systems

Indicator dimension	Indicator domain	Indicator
Policy Indicators		
Policy	Funding and Resources	FUND2: Government funded research is targeted for improving food environments, reducing obesity, NCDs and their related inequalities.
Policy	Funding and Resources	FUND3: There is a statutory health promotion agency in place that includes an objective to improve population nutrition, allocated with a specific budget line.
Policy	Governance	GOVER2: Policies and procedures are implemented for using evidence and Health Impact Assessments in the development of food and nutrition policies.
Policy	Governance	GOVER3: Policies and procedures are implemented for ensuring transparency in the development of food and nutrition policies, including transparent guidelines on how to involve industry and mechanisms to safeguard against conflicts of interest and protect public's interest.
Policy	Inequality	INEQUAL1: Systems are in place to regularly monitor household food and nutrition insecurity at a National level.
Policy	Inequality	INEQUAL3A: There are processes in place to ensure that population nutrition, health outcomes and reducing health inequalities or health impacts in vulnerable populations are considered and prioritised in the development of all government policies relating to food.
Policy	Inequality	INEQUAL5: Waste reduction policies for food retail and food service outlets are in place.
Policy	Monitoring and evaluation	MONIT6: Progress towards reducing health inequalities or health impacts in vulnerable populations and social and economic determinants of health are regularly monitored.
Policy	Retail	RETAIL1 : Zoning laws and policies are implemented to place limits on the density or placement of quick serve restaurants or other outlets selling mainly unhealthy foods in communities, particularly around schools, and/or access to these outlets, (such as opening hours.
Policy	Retail	RETAIL2: Zoning laws and policies are implemented to encourage the availability of outlets selling fresh fruit and vegetables and/or access to these outlets, such as opening hours, or frequency of markets.
Policy	Retail	RETAIL3: The government ensures existing support systems are in place to encourage the promotion and availability of healthy foods in food retail outlets by improving the food choice environment through, for example, framing in promotion policies, choice of shelf placement, type of food that is displayed close to the cashiers.
Environmental determinants		

Meso/Macro	Environmental Food Availability and Accessibility	Neighbourhood healthy food availability
Product	Extrinsic Product Attributes	Nutritional information
Micro	Portion Size	Portion size from manufacturers and food outlets in settings
Interpersonal determinants		
Social	Household literacy level	Food literacy on the household level (composite score)
Individual determinants		
Biological	Biological	Biological
Psychological	Psychological	Psychological
Behaviour outcomes		
Behaviour	Dietary behaviour	Meal location
Behaviour	Minority group specific indicators	Changes in eating habit
Abbreviations: FUND, funding and resources; GOVER, governance; INEQUAL, Inequality; MONIT, monitoring and evaluation. These abbreviations were adapted from the INFORMAS FOOD-EPI domains (4)		

Table 5. Physical activity and sedentary behaviour indicators that are not currently available in EU monitoring systems

Indicator dimension	Indicator domain	Indicator
Policy indicators		
Physical environment	Active environments	Government supports prioritising integrated urban design and mixed land-use policies prioritising compact, mixed-land use in urban, rural and transport plans (MOVING M4.3).
Physical environment	Active environments	Government supports the increased provision of public transport (MOVING M4.2).
Physical environment	Active environments	Government supports increasing road safety actions for pedestrians, cyclists etc. (MOVING M4.5).
Society	Active Societies	Government supports financial incentives for individuals to promote physical activity (MOVING M1.6).
Funding and resources	Active systems	Interdisciplinary research funding - increase research capacity across all sectors on the rates of physical inactivity or activity and policy interventions.
Environmental determinants¹		
Worksite, workplace setting/Kindergarten, school, university setting	Availability/accessibility	Availability of outdoor activity space in kindergarten/university/workplace.
Worksite, workplace setting/Kindergarten, school, university setting	Availability accessibility	Availability of indoor activity space in kindergarten/university/workplace.
Interpersonal determinants		
Home, neighbourhood, community setting/Worksite, workplace setting	Supportive behaviour by friends/parents/by partner/by colleagues	Proportion of people (all age groups) who receive significant social support from friends, colleagues, partners, parents, other relatives to be physically active.
Home, neighbourhood, community setting	Physical activity with parents	Proportion of children who conduct physical activity with their parents at least one hour per week (AdiMon D1.12).
Behaviour outcomes		
Behaviour	Domain-specific sedentary behaviour	Sitting time at work/in kindergarten/school/university, during transportation in a car/bus and in leisure-time.
Behaviour	Non-organized sports/exercise participation	Non-organized sports/exercise participation.

Behaviour	Physical activity in kindergarten	Average active play time per day in kindergarten.
1 Measures for these indicators were found for the school level setting.		
MOVING: A policy monitoring tool for physical activity created as part of CO-CREATE project (14). These indicators were taken from this tool.		
AdiMON: A population-wide system to monitor the factors relevant to childhood obesity, created by the Robert Koch Institute (24)		

Conclusion

We have made significant progress along the roadmap to a pan European harmonised monitoring and surveillance system as described by Hebestreit et al (9). The provision of a catalogue of indicators and their sources provides key stakeholders the opportunity to integrate evaluation measures into their policy planning and development. While the present research could not map all the key EU policy indicators to existing data, the majority of those within the catalogue are currently being measured in existing European monitoring and surveillance systems. Therefore, much of the evidence for evaluation of policies is readily available. The next step will require the development and implementation of standardised instruments for measuring these indicators and a protocol for using these instruments. This will enable a harmonised approach to evaluating the policies that determine diet, physical activity, and sedentary behaviours of European populations.

List of abbreviations

CDC Centers for Disease Control and Prevention

COSI WHO Childhood Obesity Surveillance Initiative

CO-CREATE Confronting Obesity: Co-creating policy with youth

DALYs Disability adjusted life years

DEDIPAC Determinants of Diet and Physical Activity

DONE Determinants Of Nutrition and Eating

ECHIM European Community Health Indicator Monitoring System

EHIS

European Health Interview Survey

EPHA European Public Health Alliance

ESS European Social Survey

EU European Union

EU SILC European Union Statistics on Income and Living Conditions

Food-EPI Food-Environment Policy Index

HBSC WHO Health Behaviour in School-aged Children

HE² Healthy and Equitable Eating

INFORMAS International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support

LMICs Low income and Middle income countries

NCD Non-communicable disease

PA Physical Activity

PEN Policy Evaluation Network

SB Sedentary Behaviour

SHARE Survey of Health, Ageing and Retirement in Europe

STOP Science and Technology in childhood Obesity Policy

SUN Scaling Up Nutrition

SUN MEAL Scaling Up Nutrition Monitoring, Evaluation and Learning

UNICEF The United Nations International Children's Fund

WHO World Health Organisation

WHO FNAP WHO Food and Nutrition Action Plan 2015–2020

WHO GAPP WHO Global Action Plan on Physical Activity 2018–2030

WHO GNPR WHO Global Nutrition Policy Review

WHO HEPA PAT WHO Health Enhancing Physical Activity Audit Tool

Additional files

File 1

PEN key diet indicator catalogue

File 2

PEN key physical activity and sedentary behaviour indicator catalogue

Declarations

Declarations

Ethics approval and consent to participate

'Not applicable'

Consent for publication

'Not applicable'

Availability of data and materials

The dataset supporting the conclusions of this article are included within the article and its additional files.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

WA is the overall leader of PEN project, AH is the leader of the work package research group. GBMM, LGR, CM, AH, SD and KAO contributed to the conception and design of the indicator mapping process. IS and

CM completed the mapping process for the diet indicators and ANP and KWT mapped the physical activity and sedentary behaviour indicators. LGR,GBMM, SD, AH, KAO and CW conducted secondary checks and evaluations of the indicator mapping. IS and CM wrote the first draft of this manuscript. All authors contributed to the revision of the manuscript. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Figures

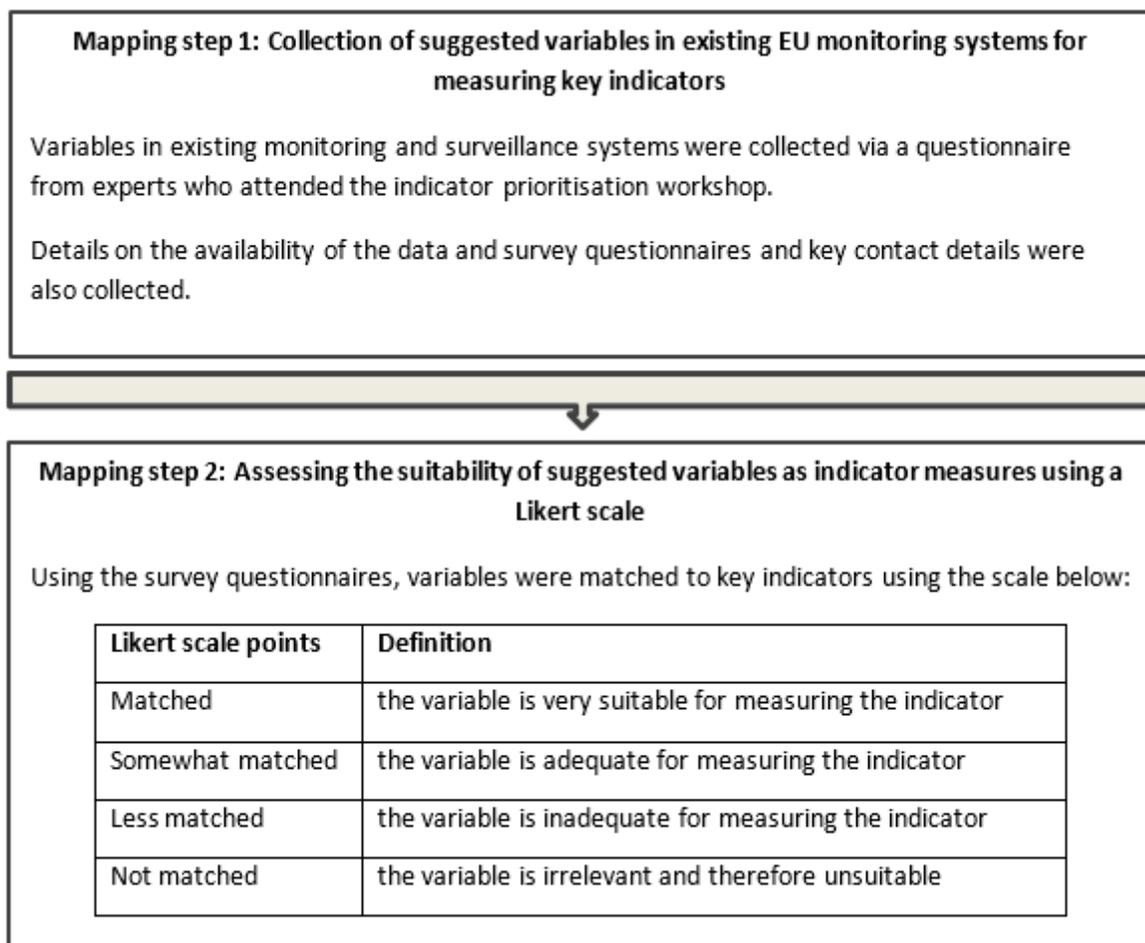


Figure 1

The process used to map key indicators for diet, physical activity and sedentary behaviour to existing pan European monitoring systems.

Supplementary Files

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