



# HealthPros

International Training Network for  
Healthcare Performance Intelligence Professionals



---

## PRACTICAL EXPERIENCE WITH IMPLEMENTING DISPARITY AND COMPOSITE MEASURES IN LARGE-SCALE ROUTINE QUALITY IMPROVEMENT WORK TO SUPPORT TRANSFERABILITY TO OTHER HC SYSTEMS

---

### Healthcare Performance Intelligence Series No. 1.2 2022

#### **HealthPros Fellows**

*Pinar Kara  
Yuanhang Yang  
Bernardo Meza-Torres  
Mekha Mathew  
Erica Barbazza  
Damir Ivanković  
Claire Willmington*

#### **Principal Investigators**

*Jan Mainz  
Søren Paaske Johnsen  
Simon de Lusignan  
Fabrizio Carinci*



## Series editors

### HealthPros Fellows

Erica Barbazza, Amsterdam UMC, University of Amsterdam

Pinar Kara, Aalborg University Hospital

Mekha Mathew, University of Surrey, University of Oxford

Nicolas Larrain, Optimedis AG

Kendall Gilmore, Sant'Anna School of Advanced Studies

Damir Ivanković, Amsterdam UMC, University of Amsterdam

Óscar Brito Fernandes, Corvinus University of Budapest

Sophie Wang, Optimedis AG

Bernardo Meza, University of Surrey, University of Oxford

Claire Willmington, Sant'Anna School of Advanced Studies

Mircha Poldrugovac, Amsterdam UMC, University of Amsterdam

Véronique Bos, Amsterdam UMC, University of Amsterdam

### Principal Investigators

Niek Klazinga, Amsterdam UMC, University of Amsterdam

Dionne Kringos, Amsterdam UMC, University of Amsterdam

Jan Mainz, Aalborg University Hospital

Søren Paaske Johnsen, Aalborg University Hospital

Simon de Lusignan, University of Oxford

Fabrizio Carinci, University of Bologna

Oliver Gröne, Optimedis AG

Sabina Nuti, Sant'Anna School of Advanced Studies

Anna Maria Murante, Sant'Anna School of Advanced Studies

László Gulácsi, Corvinus University of Budapest

Petra Baji, Corvinus University of Budapest

### Support staff

Frank Groen, Amsterdam UMC, University of Amsterdam

Laurian Jongejan, Amsterdam UMC, University of Amsterdam

# PREFACE

HealthPros is a H2020 Marie Skłodowska-Curie Innovative Training Network for Healthcare Performance Intelligence Professionals under grant agreement No 765141, running from January 2018–April 2022. Healthcare performance intelligence can be defined as a structured approach to acting on health policies, using knowledge and information generated through scientific methods and health data to systematically measure indicators of health system performance. The network set out with the aim to train a first generation of Healthcare Performance Intelligence Professionals (HealthPros Fellows) that can make effective use of available healthcare performance data in countries to improve integrated services delivery, patient engagement, equality in access to healthcare, health outcomes and reduce waste in healthcare.

Since 2018, HealthPros Fellows have completed innovative research and multidisciplinary training in Canada, Denmark, Germany, Hungary, Italy, the Netherlands and the United Kingdom. As part of their training, Fellows also completed secondments at partner organizations as an opportunity to obtain local guidance and conduct applied research.

Throughout the programme, HealthPros Fellows have worked to develop tools and implement methods to streamline healthcare performance measurement, develop and apply performance-based governance mechanisms and optimize the use of healthcare performance intelligence by different end-users. Topics explored through a healthcare performance intelligence lens in their work include: actionability of performance indicators; composite measures; integrated care; corporate governance tools; patient and citizen engagement; nudging; use of routine databases for performance improvement; and, long-term care. As the COVID-19 pandemic paralleled the HealthPros programme, many Fellows and the network at-large, sought opportunities to conduct a number of COVID-19-related studies at pace with the pandemic's changing context.

Outputs of the HealthPros programme have continuously been published as open access studies in international, peer-reviewed journals. Additionally, Fellows have actively contributed to webinars, conferences, the delivery of courses, policy dialogues, direct country support, and media engagements, among other types of dissemination to continuously share new findings throughout the programme.

This **Healthcare Performance Intelligence Series** represents the culmination of key research findings by the network into a collection of reports providing methodological, practical, and policy guidance. Reports in the series are tailored to different audiences, ranging from policy-makers, hospital

managers, clinicians, and the general public. The development of each report in the series has relied on close collaboration across the HealthPros network. The range of topics and resources making up this series includes the following:

- Practical experience with implementing disparity and composite measures in large-scale routine quality improvement work to support transferability to other HC systems (current)
- Advancing the performance assessment of integrated healthcare systems: A policy brief (No. 1.4 2022)
- Policy guidance on the use of PREMs to improve health system performance (No. 2.2 2022)
- Policy summary report on the value of results-based tools in health care management-Lessons learned from COVID-19 dashboards (No. 2.3 2022)
- Business model for effectively involving patients in the financial decision-making of health insurance funds- A guide to health care insurers on fostering the engagement of citizens based on recent experiences in the Netherlands. (No. 2.4 2022)
- Policy summary report on best practices for linking financial incentives to health care performance at individual health care provider, institutional and regional level- A business case for value-based health care systems based on performance intelligence (No. 2.5 2022)
- Policy Brief: The role of nudging for health care performance assessment agencies

The full series of reports can be found online (<https://www.healthpros-h2020.eu/>). For questions related to the series or HealthPros network please contact Dionne Kringos, PhD ([d.s.kringos@amsterdamumc.nl](mailto:d.s.kringos@amsterdamumc.nl)).

# CONTENT

1. Introduction .....	1
1.1. Disparity in health as a key health policy priority in the 21st century .....	1
1.2. Composite measures of quality of care .....	1
2. Disparity in healthcare .....	2
2.1. Measures of socioeconomic position .....	2
2.2. International experiences with measures of disparity and inequality .....	3
2.3. Practical recommendations .....	7
3. Composite measures of quality of care .....	7
3.1. Methodological considerations for composite indicators .....	7
3.2. International experiences with composite indicators of quality of health care .....	9
3.3. Practical recommendations .....	10
4. References .....	12

# 1. Introduction

## 1.1. Disparity in health as a key health policy priority in the 21st century

The primary goal of any healthcare system is to provide health services that optimize the population's health and efforts to improve the quality of health services are the key in order to reach this goal.<sup>1</sup> Still, socioeconomic disparity in health, including disparity in life expectancy and disease burden, are well-established.<sup>2</sup> Several factors may contribute to this disparity of which many are outside the control of the health care system, e.g. the societal distribution of wealth and housing and employment policies. However, disparities may also exist in the access to and quality of care.<sup>3</sup> Unjustified and unintended differences in care are consequently a challenge for healthcare systems that need to be identified and addressed.

When aiming to investigate potential disparities in health care, a number of questions arise: How should socioeconomic position (SEP) be defined? How should quality of care be measured? Which methods should be used to analyze the data?

## 1.2. Composite measures of quality of care

Valid assessment of the quality is crucial in order to monitor, evaluate and improve the quality of healthcare services. Quality indicators are measurement tools that are used to quantify the quality of care. They serve various purposes such as documenting the quality, benchmarking, setting priorities, facilitating quality improvement and supporting patient choice of providers.<sup>4</sup> The use of quality indicators is widespread in health care and the number of indicators is huge. Consequently, there is an increasing interest for composite measures based on a combination of multiple indicators.

A composite measure can be defined as a combination of multiple individual indicators.<sup>5</sup> Individual indicators are useful for measuring specific aspects of quality, however, an overall measure that reflects multiple aspects and dimensions of quality may have some considerable advantages over individual indicators. Indeed, composite indicators can summarize the quality of care as a single value. Hence, they can be helpful when comparing, rating, ranking, and selecting healthcare providers as an alternative to assessing providers' performance according to many individual indicators.<sup>6</sup>

However, composite indicators also come with limitations. Differences and relationships between individual indicators may be masked and information regarding specific aspect(s) of performance can be lost.<sup>5</sup> Using different approaches for construction of the composite measures may give different results. In other words, composite measures can be sensitive to the methodology that has been used.<sup>7</sup> Therefore, if the construction process for the composite indicators is not transparent, composite

indicators may be misused and if not constructed in a methodologically sound way, the results obtained by using these indicators (such as hospital rankings) may not be reliable.<sup>8</sup>

## 2. Disparity in healthcare

It is a key health policy agenda in many health care systems to address disparities in healthcare and there is therefore a need for a better understanding of how diverse socioeconomic factors are associated with quality of care in order to inform stakeholders. However, there is no established overview of the existing studies, including the methods and data used so far and the key findings.

Different terms are used when assessing differences in health and healthcare according to socioeconomic factors, including disparity, inequality and inequity. Please see section 2.2 for a more in-depth description on the terminology.

We conducted a systematic review to investigate methods and data used to describe SEP in studies on disparities in quality of care and statistical methods used for analyzing disparities in quality of care. Original studies using process indicators to evaluate the quality of care delivered to the patients were included. The studies should specifically address socioeconomic disparity in these process indicators.

A total of 5174 publications were screened, of which 81 were assessed as full-text publications for eligibility. In total, 34 publications were included. Among the 34 included studies, 24 studies found at least one significant difference in process quality of care among patients with different socioeconomic backgrounds.

### 2.1. Measures of socioeconomic position

In our literature review, area-based socioeconomic factors were investigated in 16 studies whereas 18 studies examined socioeconomic variables measured at the individual level. In total, 13 studies used a composite score or an index, which combines at least two factors to measure patient's socioeconomic background. Among these 13 studies, the majority of composite indices being used were developed and published by relevant national administrative organizations or healthcare associations. Only the study by Niklasson et al.<sup>9</sup> used their own-defined socioeconomic status index. The study by Leeds et al.<sup>10</sup> used a combination of two measurements, a composite socioeconomic score and insurance type.

The socioeconomic factors were handled in different ways in the analyses, i.e., using cut-off(s), quantile(s), and categories. The most used quantile(s) in the included studies were tertile(s) followed by quintile(s). Only one study used decile(s).

Regression models were the most used statistical method for analyzing disparity in quality of care. In total, 28 studies used regression models, where 21 studies used a logistic regression model, six studies used a linear regression model, three studies used a Generalized Estimating Equation, and one study used a Poisson regression model.

Among the 28 studies that used regression models, five of them did not specify whether they had adjusted for any covariates in their statistical analyses, while the remaining studies adjusted for at least one covariate. The most frequently covariates included in the multivariable models in descending order were as follows: age, gender, clinical factors, other relevant factors, race, and sociodemographic factors other than the socioeconomic factors that were under investigation.

Our review demonstrated that the amount of research into disparity of the quality of care is still quite limited, particularly in developing countries. However, the vast majority of identified studies found significant socioeconomic disparity in the process quality of care in different disease area across various types of care.

## 2.2. International experiences with measures of disparity and inequality

### **Inequalities and disparities in healthcare from the United Kingdom perspective**

Inequalities and disparities in health care often overlap to create a general sense of unfairness in health service provision to some elements of a population.<sup>11</sup> It is argued that inequalities and disparities can be used interchangeably, both concepts relating to how “social advantage” is translated into difference in health, with the real difference being between inequality/disparity and health equity.<sup>12</sup> However, our view is that “disparity” implies plausibly avoidable variance<sup>13</sup>, whereas “inequality” implies injustice.<sup>14</sup> Disparities and inequalities are intertwined, with inequity linked to the concept of vertical-inequity while disparities linked to horizontal-inequity.

#### **Defining inequality in healthcare**

Inequality is not random and is where a group is treated unequally. The group as a whole is treated with inequity, but within the group there is equity. For example, aboriginal populations in many populations experienced inequality in the health care they received, but within this population there was equity. In the NHS primary care weighting of population-based funding is on large geographical areas so that a wealthy area in a poor region will be better funded than deprived area in a wealthy region.<sup>15</sup> We describe this phenomenon as a “vertical inequity” issue.

#### **Defining disparity in healthcare**

Racial and ethnic disparities in health are commonly evaluated in research. Disparities exist when there is deviation from the principle of “horizontal equity,” which requires people with same health needs have equal access to healthcare. For example, whilst diabetes disproportionately affects some racial and ethnic minority populations, they have historically also received a lower standard of care.

#### **Inequalities and disparities reported by the English Sentinel network:**

We report examples of inequalities and disparities from the (Oxford-Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC)). Whether as a consequence of socioeconomic position, demographics or other cause, there exists an uneven distribution of health.

Previous studies proved socioeconomic inequality existence in health outcomes, including cardiovascular disease, infections and mental health.<sup>16-18</sup>

The RSC sentinel network dataset is one of Europe's oldest sentinel systems. The RSC is now over 1,800 nationally representative practices and in its 54th season of surveillance.<sup>19</sup> The English National Health Service (NHS) has a capitation-based system, and each citizen is registered with a single GP. This makes population-based research possible. Additionally, the English NHS distributes resource at the regional level taking account of capitation.

The RSC uses The English Indices of Multiple Deprivation (IMD) for relative levels of deprivation in 32,844 small areas or neighborhoods, called Lower-layer Super Output Areas (LSOA). We identify LSOA from post code prior to pseudonymization. The IMD depends on multiple factors, such as, income, employment, education, health, crime, barriers to housing, and living environment. The indices are divided into 10 equal groups, ranging from the most deprived 10% of LSOA's to the least deprived 10% of LSOA's.<sup>20</sup> The IMD quintiles are consolidated into 5 number, 1 being the most deprived to 5, which is the most affluent. It provides a useful indication of which areas are more or less disadvantaged and can be used to assist with un-biased decision-making activities in the future.

Evidence from the RSC is accumulating that differing levels of deprivation have different rates of diseases. People in the more deprived groups (IMD quintiles 1–4) were more likely to have cardiovascular diseases than those in the least deprived group (IMD quintile 5).<sup>16</sup> Also, there was a clear gradient in socioeconomic status in the household incidence of acute gastro enteritis (AGE), with the most deprived having higher rates and the least deprived the lowest.<sup>17</sup>

Similarly, in the general practices, with increase in proportion of children in the lowest IMD quintile, less prescriptions for stimulant medication for children with ADHD was observed.<sup>18</sup> In England, racial/ethnic minorities experience greater morbidity and mortality from various chronic diseases than non-minorities. Despite access to primary care being equitable, they also tend to receive lower quality of care.<sup>21</sup>

Currently, there are 18 ethnic groups recommended for use by the government of England when asking for someone's ethnicity. These are grouped into 5 ethnic groups, with an 'other' option where people can describe their ethnicity in their own words. These groups were used in the 2011 Census of England and Wales and are Black/White/Asian/Mixed/Other.<sup>22</sup> The RSC uses the same groups.<sup>23</sup>

From previously published work from the RSC, people who recorded black ethnicity had raised and uncontrolled blood pressure, had worse glycemic control, were more likely to be with neutropenia, were associated with an increased risk of a positive SARS-CoV-2 test and were associated with an increased risk of excess mortality during Covid-19 compared to white ethnicity.<sup>24-28</sup>

Additionally, although there may be good seasonal influenza vaccine uptake in the younger population, there is less uptake in older people from ethnic minorities. This could be a contributing factor for higher incidence of seasonal influenza and greater probability of presenting at the general practice with influenza like symptoms within ethnic minorities.<sup>29</sup> There are limited publications on cancer, with one recent publication showing no association of IMD status or ethnicity with the length of survival in patients with pancreatic cancer.<sup>30</sup>

### Summary:

There remain significant disparities, and inequities in the health and care of the English population. Policies need to address these. In particular, making reallocation of resources reflective of individual locality needs, rather than by broad geographical area. 15 Most of the differences are

disparities, but regional reallocation of resource means that there are in-built inequalities where say a London practice in an affluent area is much better funded than a general practice in a deprived locality in an otherwise affluent area.

### Reporting on population breakdowns on COVID-19 dashboards

Since the outbreak of the COVID-19 pandemic, dashboards have been adopted by governments worldwide as the modus operandi for delivering pandemic-related data. In early 2020, our research network of healthcare performance intelligence professionals set out to explore the state of the art of publicly available web-based COVID-19 dashboards and identify features conducive to their actionability, where actionability refers to a dashboards potential to inform decision-making. Applying a multimethod search strategy, dashboards were identified, assessed using a study-specific tool, and scored using nominal group technique. See Ivanković et al. for reporting on the methods and results in full.<sup>31</sup>

In total, 158 dashboards from 53 countries were assessed as they appeared in July 2020. On the assessment item of population disaggregation options, just over half (96/158, 60.8%) of dashboards had some form of population breakdowns for indicators reported. The most frequently available breakdown was age (79/96, 82.3%) and sex (71/96, 74.0%). Other socioeconomic breakdowns were infrequent and found on less than a fifth of the dashboards. These breakdowns included reporting on ethnicity (12/96, 12.5%), race (10/96, 10.4%), or socio-economic status (2/96, 2.1%). The dashboards including these breakdowns were consistently from Australia, Canada, New Zealand or the United States. The study also found providing break downs by relevant population subgroups a key factor to a dashboard's overall actionability by way of facilitating equity-driven decision-making.

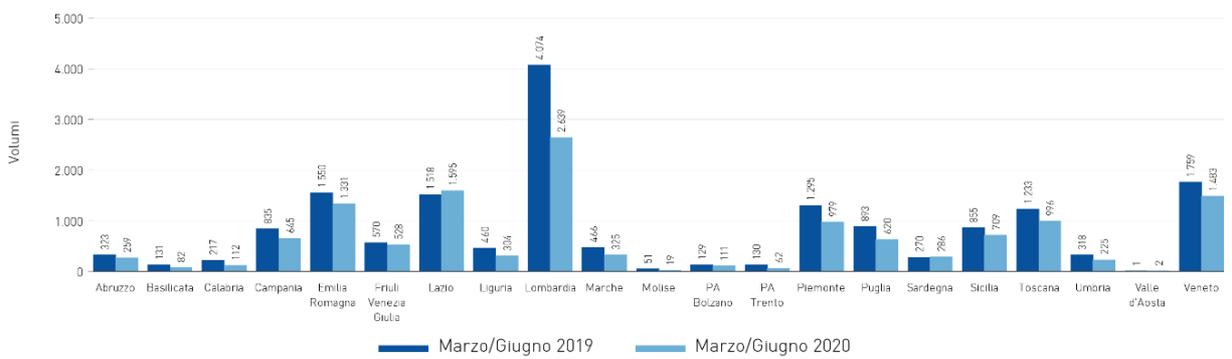
In a follow-on study, we explored the extent to which dashboards changed over time.<sup>32</sup> Looking specifically in the Canadian context to a pan-Canadian sample of COVID-19 dashboards (N=26), we found a slight increase in the number of dashboards reporting ethnicity and race-based data, though no change in the reporting on socioeconomic status between July and November 2020. Overall, the actionability feature of breaking down the population to relevant subgroups was found as "somewhat present" on the dashboard in November 2020.

Our findings reveal work is still needed in order to ensure COVID-19 data does not mask the inequitable burden of the pandemic. The challenge to collect and report this data appears to be a multitude of factors including data governance standards, privacy protection and data infrastructure. Countries that have reported socioeconomic features in their COVID-19 dashboards may be a source of insights to overcome these limitations.

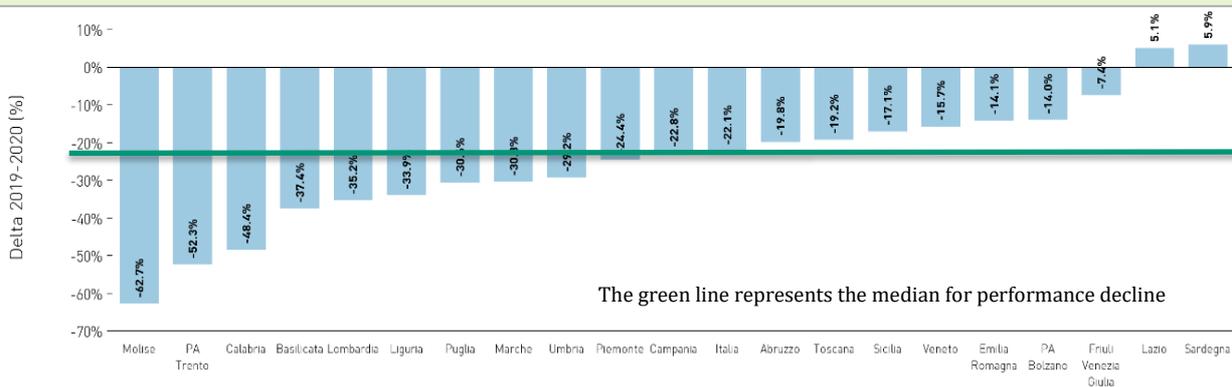
### Assessing resilience of the Italian health system in the time of COVID-19

Resilience was assessed by measuring whether Italy's 20 regions were able to maintain responsiveness to the population's common health needs under circumstances created by COVID-19. To do so, performance on 24 indicators conveying information on volumes of utilized services, ranging from oncological and cardiovascular care to urgent hospitalizations were compared between 2019 and 2020 for each region. These indicators were generated by National Agency for Regional Health

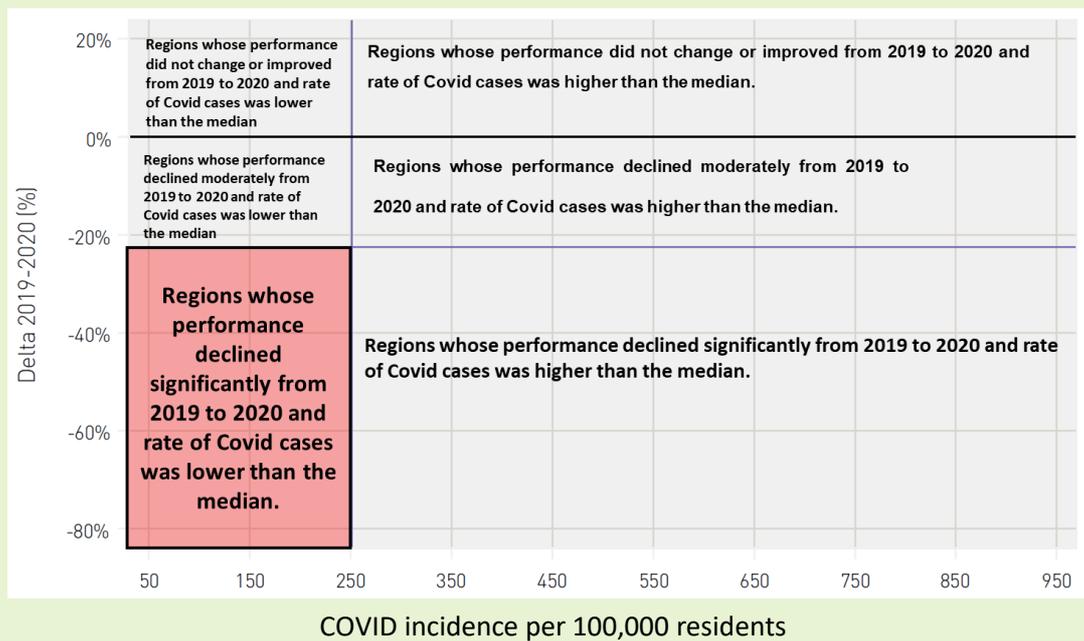
Services (AGENAS) and The National Screening Observatory. The results were displayed using the following visuals:



Differences in percentage of breast cancer surgery volumes per region - March-June 2019 vs. March-June 2020



To further assess the responsiveness of regions, the incidence rate of Covid cases was taken into account in each region resulting in the following classification:



Communication of the results as well as effective visualization enable decision-makers within each regional health system to identify gaps in the provision of healthcare services and take subsequent action.<sup>33</sup>

## 2.3. Practical recommendations

- Monitoring socioeconomic disparity in quality of health care is a prerequisite if the aim is to effectively reduce or eliminate the disparity. However, there is no established international consensus on how to measure socioeconomic status or how to analyze socioeconomic disparity in health care. Hence, the pragmatic advice would be that it is preferable for health care providers to initiate monitoring based on the data and analytical tools and competences that are available rather than to wait for a broader consensus, more detailed data or capacity building of more advanced competences.
- Access to individual-level data on socioeconomic factors are limited/impossible in many health care settings for legal and/or technical reasons. Area-based measures (e.g., national indices of deprivation based on a composite of multiple socioeconomic factors) is a both meaningful and effective alternative that enables timely monitoring of disparities in health care and disparities in health outcomes with a less complicated and less demanding analytical set-up.

## 3. Composite measures of quality of care

### 3.1. Methodological considerations for composite indicators

Even though there is not a standard approach to construct composite indicators, there are specific steps are recommended in order to obtain reliable indicators. These steps include defining a theoretical framework, assessment of data structure, indicator selection, assigning weights to individual indicators, aggregation of individual indicators into a composite indicator and validation of the final composite indicator. Methods for construction of composite indicators mostly differ in terms of weighting and aggregation of individual indicators. (Table 1, Table 2)

**Table 1** Examples of methods for constructing composite measures

METHODS	DEFINITION
<b>Overall percentage</b>	The composite score is calculated as the total number of processes of care delivered to all patients divided by the total number of eligible care processes. <sup>34</sup>
<b>Patient average</b>	Composite scores are calculated for each patient (number of care processes delivered divided by number of patient specific eligible care processes) and can then be averaged to obtain provider-level composite scores. <sup>34</sup>
<b>Indicator average</b>	For each indicator the percentage of times that indicator is fulfilled is calculated and then averaged across all indicators. <sup>34</sup>

<b>All-or-none (defect-free scoring)</b>	Composite measure is calculated on patient level. Each patient gets either 1 (all eligible care processes are fulfilled) or 0 (at least 1 of the eligible care processes is unachieved). This approach can be preferred especially (1) when process indicators interact or partial achievement of a series of steps is insufficient to obtain the desired result, (2) when adherence rates for indicators are very high so using methods that award partially provided care will neither be helpful in order to distinguish between providers' performance nor motivates providers to improve the quality of care. <sup>35</sup>
<b>70% standard and other thresholds</b>	This approach is similar to all-or-none scoring but using a lower threshold than 100%. <sup>34</sup>

**Table 2** Examples of weighting approaches for constructing composite measures

<b>WEIGHTS</b>	<b>DEFINITION</b>
<b>Equal weights</b>	All indicators receive the same weight. This approach generally indicates that all indicators are equally important in the composite. <sup>36</sup>
<b>Expert weights</b>	An expert panel assigns weights to individual indicators depending on the panel's criteria, such as indicators' importance, impact, evidence score, feasibility and reliability.
<b>Regression weights</b>	Each indicator is weighted according to the degree of its association with an outcome, e.g. 30-day mortality. Using regression weights, the indicator with the strongest association with the outcome receives the highest weight. This approach may be preferred if there is a gold standard end point. <sup>37</sup>
<b>Principle component analysis (PCA) based weights</b>	PCA-based weights may be preferred when individual indicators are highly correlated. In this approach, correlated indicators are grouped, since they may share underlying characteristics. In this approach, each indicator is weighted according to its proportional factor loading. <sup>38</sup> This should not be confused with methods, in which factor analysis is used only as a part of the selection process for individual indicators.

A review was conducted to assess the use of composite indicators to measure process quality of care in the literature. A total of 2711 publications were identified of which 145 were included after a screening process.

Opportunity scoring was the most used scoring method and represented in 89 out of 145 publications. The second most used method was all-or-none scoring (48/145, 36%). Out of 145 publications, 8 publications considered 70% standard and other thresholds approach. Indicator average approach was present in 19 publications.

Weighting of individual indicators before aggregation were not relevant in the 27 publications using only all or none score approach. Of the remaining 118 publications, 107 used equal weights. Differential weights were present in 16 publications.

Justification for the selected methodology used in the construction of the composite measure was found in 36 (25%) publications. Methodological limitations of composite measures were addressed in 22 (15%) publications. The reported limitations included concerns regarding loss of important information, findings being sensitive to the choice of methodology for construction of the

composite measures, concerns over the construction process, such as weighting and aggregation methods or the selection of indicators included in the composite, concerns over transparency and oversimplifying complex data. Of 145 publications, 42 (29%) mentioned specific advantages of composite indicators. Reported advantages included the comprehensiveness of the composite indicator (e.g., summarizing overall quality, presents overall picture), facilitation of comparisons, interpretability and being easier to understand, increased reliability and stability, and simplification (e.g., reduced number of indicators and numbers in quality reports).

Of the 119 publications, which used a single composite score methodology, a total of 10 (8%) publications mentioned the presence of alternative methods for the construction of composite indicators.

To summarize, despite the importance and widespread use of composite indicators to assess the quality of health care, we in this systematic review found that methodological considerations were not addressed in the majority of the publications and that there was only modest variation regarding the chosen methodology for construction of the composite measure(s). Opportunity-based scoring, indicator average and all-or-none scoring were the most frequently preferred approaches to obtain composite measures, whereas use of other methods was sparse.

### 3.2. International experiences with composite indicators of quality of health care

#### **Implementation of composite indicators for several RKKP databases, Denmark**

We conducted a study to assess the use and implementation of composite indicators for 6 RKKP clinical quality registries in Denmark; four registries regarding cardiovascular care (heart failure, cardiac rehabilitation, atrial fibrillation and in-hospital cardiac arrest) and two registries regarding mental care (depression and schizophrenia).<sup>39</sup>

In this study, it is concluded that composite indicators provide valuable insights regarding overall quality of care. Comparing quality of care using multiple individual indicators for multiple health care providers can be time consuming and difficult. For example, for schizophrenia database, 12 quality indicators were included in the study with more than 40 health care providers, resulting in more than 480 numbers to consider in order to make comparisons between health care providers. Composite indicators are valuable in such circumstances; providing an overall picture of quality and summarizing the quality of care with a single number for each region or health care provider.

However, composite indicators are not perfect and requires careful evaluation and consideration when constructing and interpreting the results. One of the main concerns regarding these measures is that they may mask important information regarding individual indicators and some important aspects may be lost. To overcome this potential problem, individual indicator level information can be also provided along with composite indicators. For example, for atrial fibrillation database, it can be seen that opportunity based composite scores for Denmark, for each region and health care provider were around 50%, whereas all-or-none scores were much lower, suggesting that there may be at least

one indicator with low achievement. Therefore, while composite indicators are valuable to assess overall picture of quality, individual indicators carry important information to investigate where the weakness and strengths are in a healthcare system or a health care provider.

The reliability of composite scores is highly dependent on the quality of the data. When the completeness, accuracy and quality are not sufficient, this may result in unreliable composite indicators. It is strongly advised only to include indicators which are considered accurate and valid by the steering groups of corresponding databases.

### **The effect of COVID-19 on the monitoring of glycaemic control and other processes of diabetes care in primary care: retrospective sentinel network database cross sectional study**

The study focuses on the change in monitoring amongst the Type 2 Diabetes (T2DM) population during the Covid-19 pandemic in England, compared to the previous year; using the Oxford-Royal College of General Practitioners (RCGP) Research and Surveillance Centre (RSC) routinely collected primary care dataset.

The annual monitoring mandated by the National Institute for Health and Care Excellence (NICE) consists of HbA1c, Blood Pressure, Cholesterol, Serum Creatinine, Urine albumin, Foot surveillance, BMI and Smoking; also known as the “bundled 8 key care checks”. The study will report the frequency of glucose monitoring, along with the other process of care, with stratification by age, gender, ethnicity, deprivation quintile and region.

Baseline assessments will be carried out, focusing on the i). Practice characteristics - location (urban/ rural), number of registered GP’s, using locum doctors and % of health care professionals; ii). Patient characteristics - with stratification by age, gender, ethnicity, deprivation quintile and presence of comorbidities.

Missing information in the routine care data causes considerable variation in the reporting of the monitoring frequency, especially with the lockdown and consequent increase in telemedicine prevalence during the pandemic. Moreover, the “bundled 8 key care checks” is exclusive to England, making it complicated for UK wide comparison, as Scotland includes retinal screening as an additional check.

### **3.3. Practical recommendations**

- **Transparency:** Transparency regarding the construction process of composite indicators is important to avoid potential misuse of composite indicators.
- **Careful evaluation of construction process, step by step:** Careful evaluation process of the methods is crucial to achieve reliable results. It should be considered that there are different approaches to construct these indicators, which may give different results (for example, when ranking health care providers based on their performance using composite indicators, use of different methods to build these indicators may affect the ranking of providers).

Construction of composite indicators include (1) defining a framework (what is aimed to be measured with the composite indicator?) (2) selection of indicators (which indicators are relevant and important to include in order to obtain meaningful composite indicators?) An expert panel

and clinicians' involvement can be considered to obtain potentially more clinically meaningful composite indicators, both for selection of relevant indicators (indicator selection) and to assess relative importance of indicators (weighting of indicators), (3) assessment of data structure, (4) weighting of individual indicators (for example, are some indicators more relevant or important to achieve the outcome of interest?) (5) aggregation of individual indicators (which aggregation method can be more relevant for the study? For example, using all-or-none scoring can be more relevant if in order to achieve outcome of interest if it is crucial to provide all care processes to the patients) and (6) validation of final composite indicator.

- **Information needs of the audience:** Even though composite measures can be very useful as they provide an overall picture of quality, information regarding important aspects of quality can be lost when combining multiple indicators into a single indicator. To avoid this, individual indicator-level information along with composite indicators can be provided. It should be considered who is the audience and what level of information they need (individual indicator-level information, “overall picture”, or both). For example, looking at information provided with composite indicators, reader can evaluate how well health care providers are doing overall and also check how well these providers are doing on each individual care indicator and where the strengths and weaknesses are, which may encourage further quality improvement.

## 4. References

1. McGlynn EA, Brook RH. Keeping quality on the policy agenda. *Health Aff (Millwood)*. 2001;20(3):82-90. doi: 10.1377/hlthaff.20.3.82 [doi].
2. Corna LM. A life course perspective on socioeconomic inequalities in health: A critical review of conceptual frameworks. *Adv Life Course Res*. 2013;18(2):150-159. doi: S1569-4909 (13)00003-8 [pii].
3. Baeten R, Spasova S, Vanhercke B, Coster S. *Inequalities in access to healthcare. A study of national policies 2018*. ; 2018. 10.2767/371408.
4. Mainz J. Defining and classifying clinical indicators for quality improvement. *Int J Qual Health Care*. 2003;15(6):523-530. doi: 10.1093/intqhc/mzg081 [doi].
5. Peterson ED, DeLong ER, Masoudi FA, et al. ACCF/AHA 2010 position statement on composite measures for healthcare performance assessment: A report of american college of cardiology foundation/american heart association task force on performance measures (writing committee to develop a position statement on composite measures). *J Am Coll Cardiol*. 2010;55(16):1755-1766. doi: 10.1016/j.jacc.2010.02.016 [doi].
6. Shwartz M, Restuccia JD, Rosen AK. Composite measures of health care provider performance: A description of approaches. *Milbank Q*. 2015;93(4):788-825. <https://pubmed.ncbi.nlm.nih.gov/26626986> <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4678940/>. doi: 10.1111/1468-0009.12165.
7. Jacobs R, Goddard M, Smith PC. How robust are hospital ranks based on composite performance measures? *Med Care*. 2005;43(12):1177-1184. doi: 00005650-200512000-00004 [pii].
8. Barclay M, Dixon-Woods M, Lyratzopoulos G. The problem with composite indicators. *BMJ Qual Saf*. 2019;28(4):338-344. doi: 10.1136/bmjqs-2018-007798 [doi].
9. Niklasson A, Herlitz J, Jood K. Socioeconomic disparities in prehospital stroke care. *Scand J Trauma Resusc Emerg Med*. 2019;27(1):53. doi: 10.1186/s13049-019-0630-6 [doi].
10. Leeds IL, Alimi Y, Hobson DR, et al. Racial and socioeconomic differences manifest in process measure adherence for enhanced recovery after surgery pathway. *Dis Colon Rectum*. 2017;60(10):1092-1101. doi: 10.1097/DCR.0000000000000879 [doi].
11. Lee H, Kim D, Lee S, Fawcett J. The concepts of health inequality, disparities and equity in the era of population health. *Applied Nursing Research*. 2020;56:151367. <https://www.sciencedirect.com/science/article/pii/S0897189720305413>. doi: <https://doi.org/10.1016/j.apnr.2020.151367>.
12. Braveman P. Health disparities and health equity: Concepts and measurement. *Annu Rev Public Health*. 2006;27:167-194. doi: 10.1146/annurev.publhealth.27.021405.102103 [doi].
13. Braveman PA, Egerter SA, Woolf SH, Marks JS. When do we know enough to recommend action on the social determinants of health? *Am J Prev Med*. 2011;40(1):S58-S66. <https://doi.org/10.1016/j.amepre.2010.09.026>. doi: 10.1016/j.amepre.2010.09.026.
14. Whitehead M. A typology of actions to tackle social inequalities in health. *J Epidemiol Community Health*. 2007;61(6):473-478. <http://jech.bmj.com/content/61/6/473.abstract>. doi: 10.1136/jech.2005.037242.

15. Denton S, de Lusignan S. Correcting flaws in GP funding: Avoid missing pockets of deprivation and don't penalise areas with reduced life expectancy. *BMJ*. 2021;374:n1674. doi: 10.1136/bmj.n1674 [doi].
16. Hinton W, McGovern A, Coyle R, et al. Incidence and prevalence of cardiovascular disease in english primary care: A cross-sectional and follow-up study of the royal college of general practitioners (RCGP) research and surveillance centre (RSC). *BMJ Open*. 2018;8(8):e020282-020282. doi: 10.1136/bmjopen-2017-020282 [doi].
17. de Lusignan S, Sherlock J, Ferreira F, O'Brien S, Joy M. Household presentation of acute gastroenteritis in a primary care sentinel network: Retrospective database studies. *BMC Public Health*. 2020;20(1):445-8. doi: 10.1186/s12889-020-08525-8 [doi].
18. Hoang U, James AC, Liyanage H, et al. Determinants of inter-practice variation in ADHD diagnosis and stimulant prescribing: Cross-sectional database study of a national surveillance network. *BMJ Evid Based Med*. 2019;24(4):155-161. doi: 10.1136/bmjebm-2018-111133 [doi].
19. Oxford-RCGP RSC | Clinical Informatics Research Group. Using oxford-RCGP RSC for observational studies. <https://orchid.phc.ox.ac.uk/index.php/orchid-data/>. Updated 2021. Accessed 21 October, 2021.
20. GOV UK. English indices of deprivation 2019 [internet]. . <https://www.gov.uk/government/statistics/english-indices-of-deprivation-2019>. Accessed 24 September, 2021.
21. Veena Raleigh, Jonathon Holmes. The health of people from ethnic minority groups in england . <https://www.kingsfund.org.uk/publications/health-people-ethnic-minority-groups-england>. Accessed 27 September, 2021.
22. GOV.UK. List of ethnic groups. <https://www.ethnicity-facts-figures.service.gov.uk/style-guide/ethnic-groups>. Accessed 27 September, 2021.
23. Tippu Z, Correa A, Liyanage H, et al. Ethnicity recording in primary care computerised medical record systems: An ontological approach. *J Innov Health Inform*. 2017;23(4):920. doi: 10.14236/jhi.v23i4.920 [doi].
24. Sheppard JP, Nicholson BD, Lee J, et al. Association between blood pressure control and coronavirus disease 2019 outcomes in 45 418 symptomatic patients with hypertension: An observational cohort study. *Hypertension*. 2021;77(3):846-855. doi: 10.1161/HYPERTENSIONAHA.120.16472 [doi].
25. Whyte MB, Hinton W, McGovern A, et al. Disparities in glycaemic control, monitoring, and treatment of type 2 diabetes in england: A retrospective cohort analysis. *PLoS Med*. 2019;16(10):e1002942. doi: 10.1371/journal.pmed.1002942 [doi].
26. Nikiphorou E, de Lusignan S, Mallen C, et al. Haematological abnormalities in new-onset rheumatoid arthritis and risk of common infections: A population-based study. *Rheumatology (Oxford)*. 2020;59(5):997-1005. doi: 10.1093/rheumatology/kez344 [doi].
27. de Lusignan S, Dorward J, Correa A, et al. Risk factors for SARS-CoV-2 among patients in the oxford royal college of general practitioners' research and surveillance centre primary care network: A cross-sectional study. *Lancet Infect Dis*. 2020;20(9):1034-1042. doi: S1473-3099(20)30371-6 [pii].
28. de Lusignan S, Joy M, Oke J, et al. Disparities in the excess risk of mortality in the first wave of COVID-19: Cross sectional study of the english sentinel network. *J Infect*. 2020;81(5):785-792. doi: S0163-4453(20)30564-8 [pii].

29. de Lusignan S, Correa A, Pathirannehelage S, et al. RCGP research and surveillance centre annual report 2014-2015: Disparities in presentations to primary care. *Br J Gen Pract.* 2017;67(654):e29-e40. doi: 10.3399/bjgp16X688573 [doi].
30. Jeffreys N, Dambha-Miller H, Fan X, et al. Using primary care data to report real-world pancreatic cancer survival and symptomatology. *Stud Health Technol Inform.* 2021;281:168-172. doi: 10.3233/SHTI210142 [doi].
31. Ivanković D, Barbazza E, Bos V, et al. Features constituting actionable COVID-19 dashboards: Descriptive assessment and expert appraisal of 158 public web-based COVID-19 dashboards. *J Med Internet Res.* 2021;23(2):e25682. doi: 10.2196/25682 [doi].
32. Barbazza E, Ivanković D, Wang S, et al. Exploring changes to the actionability of COVID-19 dashboards over the course of 2020 in the canadian context: Descriptive assessment and expert appraisal study. *J Med Internet Res.* 2021;23(8):e30200. doi: 10.2196/30200 [doi].
33. Agenas and mes laboratory: Analysis of the performance performed by the national health service for a complete department of the services. comparison between the first months of 2020 and 2019 . . . <https://www.santannapisa.it/en/institute/management/mes-management-e-sanita>.
34. Reeves D, Campbell SM, Adams J, Shekelle PG, Kontopantelis E, Roland MO. Combining multiple indicators of clinical quality: An evaluation of different analytic approaches. *Med Care.* 2007;45(6):489-496. doi: 10.1097/MLR.0b013e31803bb479 [doi].
35. Nolan T, Berwick DM. All-or-none measurement raises the bar on performance. *JAMA.* 2006;295(10):1168-1170. doi: 295/10/1168 [pii].
36. Nardo M, Saisana M, Saltelli A, et al. Handbook on constructing composite indicators: Methodology and user guide. [www.oecd.org/els/soc/handbookonconstructingcompositeindicatorsmethodologyanduserguide.htm](http://www.oecd.org/els/soc/handbookonconstructingcompositeindicatorsmethodologyanduserguide.htm) Web site. [www.oecd.org](http://www.oecd.org). Updated 2008. Accessed May, 2020.
37. Simms AD, Batin PD, Weston CF, et al. An evaluation of composite indicators of hospital acute myocardial infarction care: A study of 136,392 patients from the myocardial ischaemia national audit project. *Int J Cardiol.* 2013;170(1):81-87. <https://www.ncbi.nlm.nih.gov/pubmed/24182669>.
38. Glickman SW, Boulding W, Roos JM, Staelin R, Peterson ED, Schulman KA. Alternative pay-for-performance scoring methods: Implications for quality improvement and patient outcomes. *Med Care.* 2009;47(10):1062-1068. doi: 10.1097/MLR.0b013e3181a7e54c [doi].
39. Kara P, Johnsen SP. Construction and use of composite indicators for RKKP databases. [https://www.rkkp.dk/siteassets/om-rkkp/rapporter/rkkp\\_report\\_081120kompositte.pdf](https://www.rkkp.dk/siteassets/om-rkkp/rapporter/rkkp_report_081120kompositte.pdf). Accessed 20 November, 2021.