ADR NORTHERN IRELAND
Data-driven change

Data Insight

# Assessing the reliability and validity of the Northern Ireland Multiple Deprivation Measure 2017

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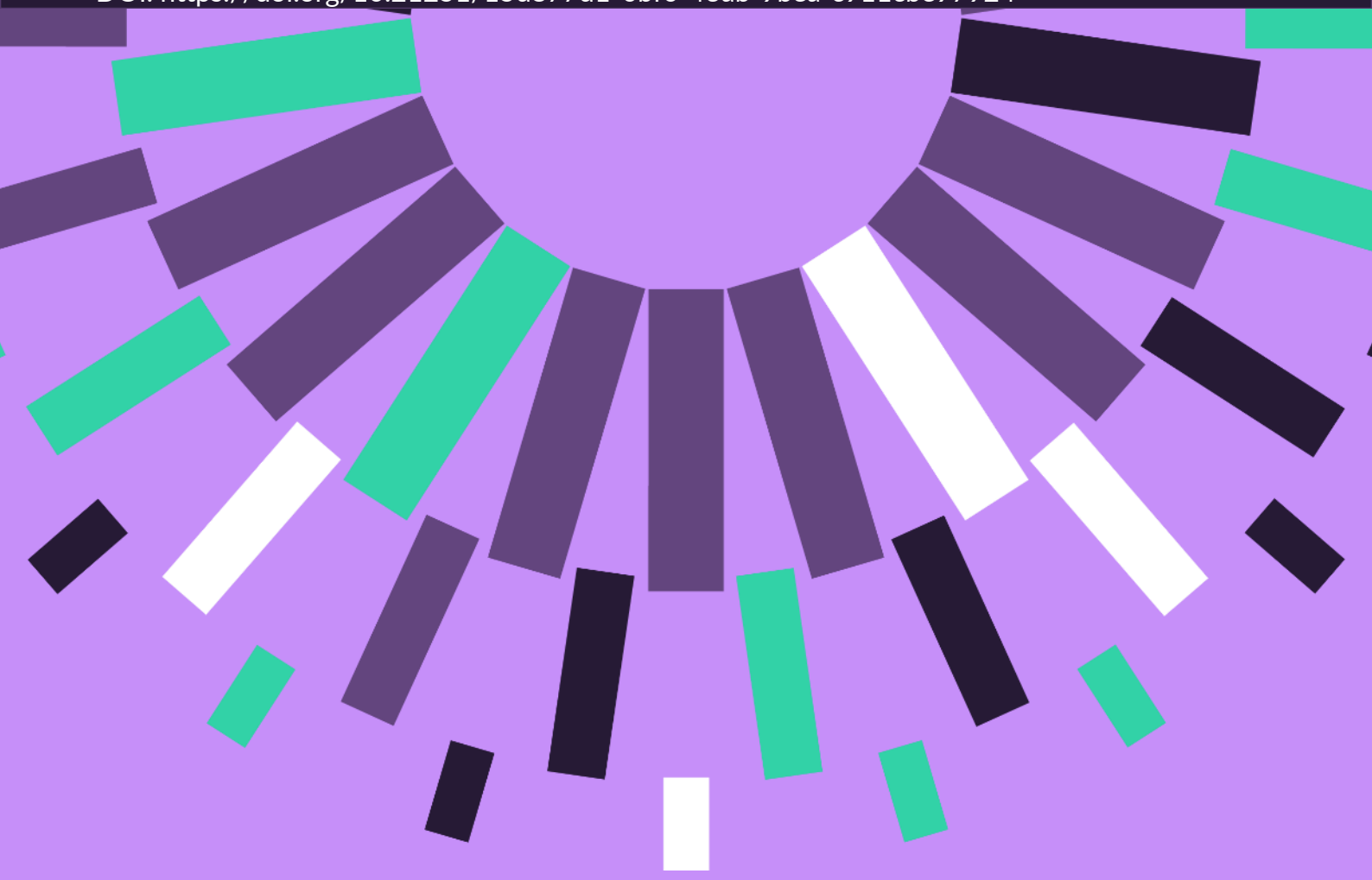
**Date:** July 2026
DOI: https://doi.org/10.21251/15d877d1-0bf0-43ab-9bea-c911cbe97924



This Data Insight explores the research utility of the Northern Ireland Multiple Deprivation Measure (2017)


# Summary

**Given that the Northern Ireland Multiple Deprivation Measure (NIMDM 2017) is widely used by administrative data researchers, we wanted to investigate whether the measure and its seven domains accurately reflect what they were designed to, and whether the measure is associated with health outcomes in the ways one would expect. Accessing NIMDM 2017 domain-indicator data via the NI Neighbourhood Information Service, and linking NIMDM data to hospital admissions data, we conducted our analyses in two-phases.**

**Phase 1** revealed that indicators within some domains were weakly associated and, therefore, did not seem to be measuring the same construct. Some indicators were also more highly associated with indicators in other domains rather than with those in their own domain. Finally the inferred seven-domain structure of the measure was not supported by the data.

**Phase 2** revealed that associations between deprivation level and health outcomes were extremely weak. While higher deprivation scores were associated with an increased risk of hospital admission for chronic obstructive pulmonary disease (COPD), substance related mental health disorder, and depression, associations with the other physical and mental health conditions were negligible.

Overall, our findings suggest that the current NIMDM may not be performing optimally, and that the statistical methods used to create the measure, may not be entirely consistent with how deprivation is most commonly conceptualised. We hope that these findings may be useful for the development of future iterations of the measure.


## Background

Small-area deprivation measures help identify the most deprived areas, supporting decisions about where resources are most needed and informing efforts to reduce health inequalities [1]. The NIMDM 2017 [2] is Northern Ireland's official measure of area-level deprivation and measures deprivation across seven domains: Income, Employment, Health & Disability, Education, Skills & Training, Access to Services, Living Environment and Crime & Disorder. Notably, the indicators representing each of these domains have been subjectively selected by representatives from NI Government Departments, Non-Governmental Public Bodies, and District Councils [3].

Validation is an important step of developing any small-area deprivation measure [1], however, the NIMDM 2017 has not previously been validated.

Employing the same statistical methods used by those who developed the measure [4], we investigated whether the NIMDM accurately reflects what it purports to. We also examined whether the NIMDM 2017 meaningfully predicts physical and mental health outcomes.

# What we did

For **Phase One**, we used publicly available data from the Northern Ireland Neighbourhood Information Service (NINIS, now the Northern Ireland Statistics and Research Data Portal https://data.nisra.gov.uk/), which provides ranked indicator, domain and overall deprivation scores for 890 Super Output Areas (SOAs) in NI. We examined whether indicators within each deprivation domain were related as expected, whether they measured the same underlying aspect of deprivation, and whether the seven domains combined to form a reliable overall measure. The analysis included correlations, internal consistency testing and confirmatory factor analysis.

For **Phase Two**, administrative data (2017 to 2023) for 740,046 adults aged ≥18 years registered with a GP in NI in 2017 were linked to hospital records from the Patient Administration System. We examined the association between deprivation and hospitalisation for several physical and mental health conditions in 2023. Patients who emigrated, died or were removed from the database for other reasons before or during 2023 were excluded from the analysis. We used descriptive statistics and regression analyses, with sensitivity analyses based on 2017 admissions and including age and sex available upon request. We examined whether overall and domain deprivation deciles were related to health conditions as expected, whether higher deprivation predicted higher hospital admission rates, and whether risk of admission would decrease as deprivation decreased.

# What we found

## *Phase 1 results*

- Most indicators within domains were satisfactorily correlated with one another; however, several indicators in the Living Environment domain showed weak, statistically non-significant, or negative correlations.
- Only the Education, Access to Services, and Crime and Disorder domains comprised indicators that were most highly correlated within those domains.
- Internal consistency testing indicated that most domains were reliably identified by indicators, however, the Income and Living domains were not.
- Indicators within the Living Environment domain were more closely associated with the overall NIMDM score than to the overall Living Environment score.
- The indicator data did not support the inferred dimensional structure of the NIMDM 2017. Individual, unidimensional domains, and a hierarchical structure which recognised seven correlated domains could not be identified with the data.

## *Phase 2 results*

- Although most health conditions were associated with deprivation, the correlations were extremely weak.
- Six of the ten health outcomes – including CHD, dementia, diabetes, hypertension and stroke – showed little or no relationship with deprivation**.** By contrast, hospital admissions for COPD, depression and mental and behavioural disorders related to substance use increased as deprivation worsened.
- There was no increased likelihood of being admitted to hospital for six of the ten health outcomes (CHD, dementia, diabetes, hypertension, stroke, and other conditions) as overall and domain deprivation worsened (see example of diabetes in **Figure 1A**).
- There was an increased likelihood of being admitted to hospital for COPD, depression, and mental and behavioural disorders due to psychoactive substance use as overall and domain deprivation worsened (see example for COPD in **Figure 1B**).

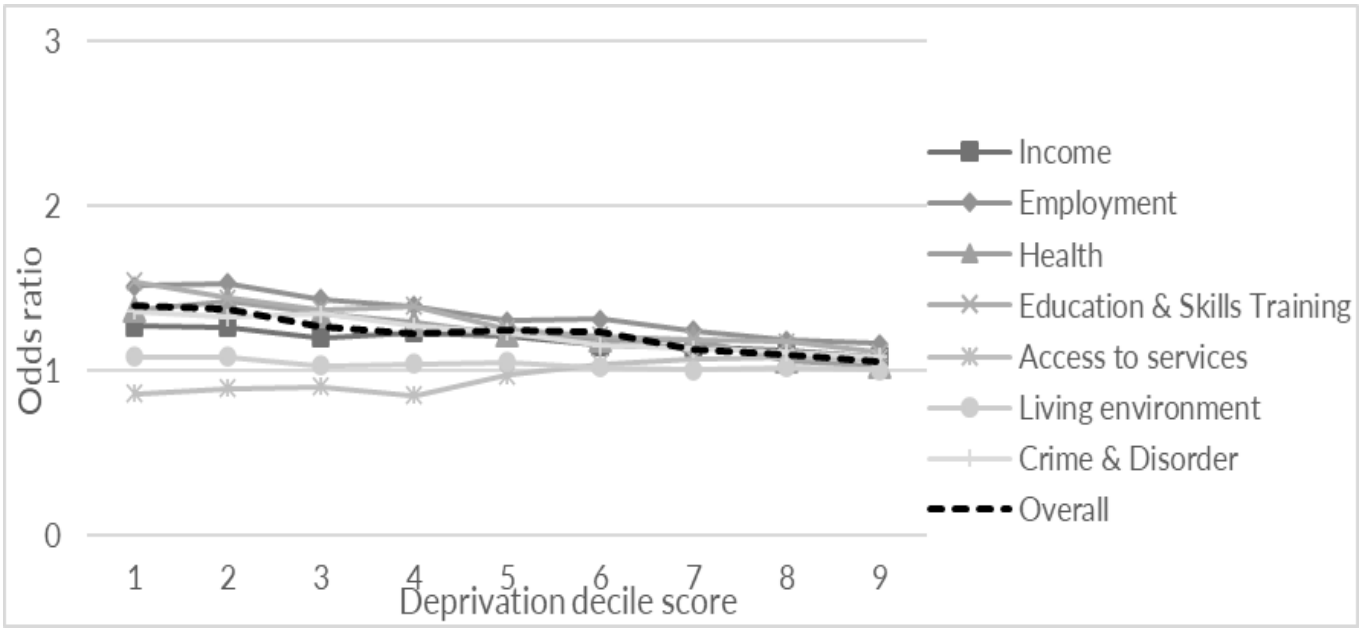



**Figure 2A:** Odds ratio for hospital admission for Diabetes across NIMDM decile scores of both the overall measure and relevant individual domains (1 = highest level of deprivation)

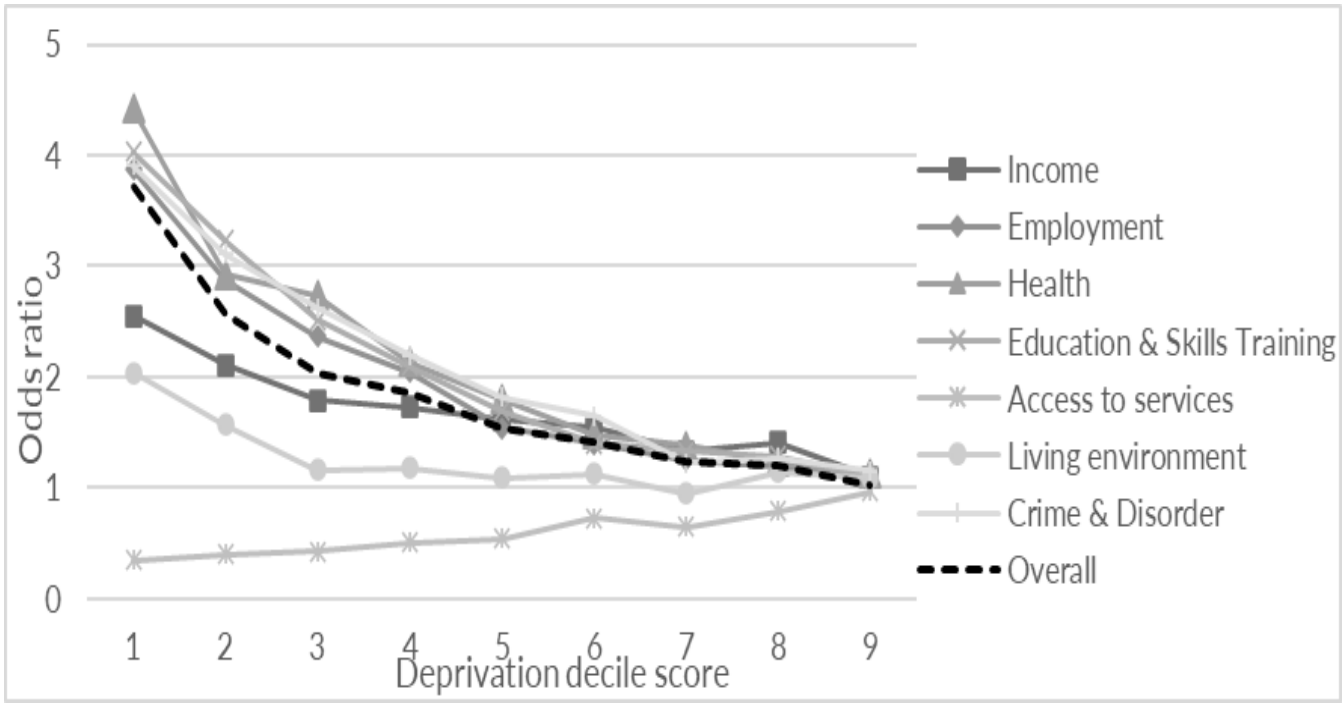



**Figure 1B:** Odds ratio for hospital admission for COPD across NIMDM decile scores of both the overall measure and relevant individual domains (1 = highest level of deprivation)

# Why it matters

The NIMDM 2017 has been widely used by researchers and policymakers to understand and attend to patterns of deprivation and need across the NI population [5,6]. Following the introduction of new statistical geographies after the 2021 Census, the current measure is now outdated, creating a need for a revised index aligned with the new spatial framework.

Small area-level deprivation measures play a central role in informing policy decisions, resource allocation, and the monitoring of health and social inequalities. However, validation has been identified as an underutilised step in their development [3]. By conducting a data-driven investigation of the NIMDM 2017, this study highlights indicators and domains that may require attention and provides evidence on how well the current measure captures variation in health risk. These findings have direct implications for the development of the next iteration of the NIMDM, and may aid in the development of a more psychometrically robust and policy-relevant measure for use by both researchers and policymakers alike.

# What next?

This project is part of a larger programme of ADRC NI research that aims to better understand deprivation and its outcomes using administrative data in NI. Other projects include:

(i) An investigation of deprivation measurement at the household level using 1991, 2001, and 2011 Census data [7]
(ii) An exploration of social mobility in NI using the NI Multiple Deprivation Measure (NIMDM 2010) [8]
(iii) Urban-rural deprivation risk for depression among adolescents [9]

Together, these projects, alongside our ADRC NI-led Poverty Roundtable Series, aim to improve the NI data-sharing landscape so that public sector data can be used to identify, understand and address the needs of groups most at risk of poor outcomes. Findings presented in this Data Insight are currently under review at the International Journal of Population Data Sciences.

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## Acknowledgements

The authors would like to acknowledge the help provided by the staff of the Honest Broker Service (HBS) within the Business Services Organisation Northern Ireland (BSO). The HBS is funded by the BSO and the Department of Health (DoH). The authors alone are responsible for the interpretation of the data and any views or opinions presented are solely those of the author and do not necessarily represent those of the BSO.

## About ADR Northern Ireland

Administrative Data Research Northern Ireland (ADR NI) is a partnership between the Administrative Data Research Centre Northern Ireland (ADRC NI) and the Northern Ireland Statistics and Research Agency (NISRA). ADRC NI is a team of research specialists at Queen's University Belfast and Ulster University who bring extensive knowledge and experience in developing innovative research for public benefit, analysing complex data sets and independent public engagement. NISRA are experts in statistics and research with a proven track record in curating, linking, and managing large-scale data sets. The ADR NI partnership is supported by the Health and Social Care Research and Development (HSC R&D) Unit.

## About ADR UK

Administrative Data Research UK (ADR UK) is a partnership transforming the way researchers access the UK's wealth of public sector data, to enable better informed policy decisions that improve people's lives. By linking together data held by different parts of government and facilitating safe and secure access for accredited researchers to these newly joined-up and deidentified data sets, ADR UK is creating a sustainable body of knowledge about how our society and economy function – tailored to give decision makers the answers they need to solve important policy questions. ADR UK is made up of four national partnerships (ADR England, ADR Northern Ireland, ADR Scotland and ADR Wales), and the Office for National Statistics (ONS), which ensures data provided by UK Government bodies is accessed by researchers in a safe and secure form with minimal risk to data holders or the public.

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