**Preliminary Form to Add Social Determinants to CSDUL**

**Request date (2025-08-19):**

| **Researcher (name and affiliation):** | Anousheh Marouzi, University of Toronto |
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| **Node Lead (name and affiliation):** | Charles Plante, Saskatchewan Health Authority |
| **Indicator or Model Name:** | Canadian Area-Level Social Determinants of Health Indicators (CASDOHI) |

**Purpose of the document**

This document includes several questions that must be answered by the researcher interested in adding indicators or models into CSDUL. These questions pretend to briefly explain the mathematical and theoretical framework of the indicator or model being incorporated. The researcher must be able to fill out every question clearly and concisely, supporting their explanation with respectable academic sources.

The document will be added to the model or indicator documentation in CSDUL-OUT and CSDUL-RDC. It must serve as a quick and straightforward introduction to the indicator or model for anyone interested and give relevant references to guide the learning process to other researchers.

**To be completed by the responsible analyst.**

**If there are questions that cannot be answered because of the nature of the indicator/model, write N/A.**

**You can support your completion using the example document located in this link:** [**Documents - Add inputs to CSDUL - 02 - Example.docx - Google Docs**](https://docs.google.com/document/d/1t4_Bh5pRtHzd8GQ3ifJWY2zjjjch8DFf/edit)

1. **Will you share the inputs through CSDUL-RDC, CSDUL-OUT, or both?** CSDUL-OUT.

1. **Explanation of the indicator/model.** 
   1. **In simple words, explain what the indicator/model to be added consists of.**

CASDOHI is a user-friendly dataset that provides over 100 standardized indicators of social determinants of health (SDOH) at the **Dissemination Area (DA) level** across Canada, harmonized between the 2011, 2016, and 2021 Censuses. It also includes **intercensal estimates (2012–2020)** using linear interpolation. Indicators cover income, education, labour force, housing, and ethnocultural characteristics. [The list of indicators is presented in Table 1 in the working paper.](https://doi.org/10.1101/2025.07.11.25331136)

* 1. **Are there assumptions associated with the indicator/model? If there are, please briefly describe them.**

Yes. Intercensal values are estimated using linear interpolation, assuming a uniform rate of change between census years. This assumption may not capture abrupt demographic or socioeconomic shifts. Additionally, DA boundaries were harmonized across census cycles using areal-weighted interpolation, which assumes population distribution is even within DAs.

* 1. **How is the indicator/model derived? Support your explanation with formulas when possible.**

**Data sources:** Statistics Canada Census Profiles (2011, 2016, 2021) and the 2011 National Household Survey (NHS).[(Statistics Canada, 2012, 2013, 2017, 2022)](https://paperpile.com/c/LkxR24/nfuO+aN8f+cIw4+vEeK)

**Step 1:** Select and harmonize indicators across years based on established Canadian deprivation indices and SDOH frameworks.

**Step 2:** For census years, indicators are directly calculated from census counts, percentages, medians, or means.

**Step 3:** For intercensal years, indicators are estimated using **linear interpolation**:



Where *xt*is the interpolated measure for year *t*, which could be a count, percentage, mean, or median. The values *x2011* and *x2016* are the known values from the 2011 and 2016 census years, respectively, and the denominator represents the time interval between census years.

**Step 4:** Harmonize DA boundaries across censuses using Statistics Canada Correspondence Files.

* 1. **What is the unit of analysis of the indicator/model? (e.g. households, persons, cities)**

Dissemination Areas (DAs) — the smallest standard Canadian census geography, typically 400–700 residents. Indicators can be aggregated to larger units (CSD, CD, CMA, health regions).

* 1. **How can the indicator be integrated with other datasets?**

CASDOHI can be linked to health and administrative datasets via **postal codes using PCCF+**, or aggregated to align with health regions, municipalities, provinces, or CMAs. It can also be merged with datasets that use census geographies.

* 1. **What are the boundaries of the indicator/model?**

Values vary depending on the indicator (percentages, ratios, medians, means). Most indicators range between **0–100%** (e.g., poverty rates, education levels, unemployment), while others are continuous measures (e.g., income and housing value).

* 1. **If you want to add a model to CSDUL, is this associated with a hypothesis? If yes, please describe their:**
     1. **Null hypothesis**
     2. **Alternative hypothesis**
     3. **The implications of rejecting the null hypothesis**

N/A

* 1. **What is the interpretation of the values of the indicator/model?**

Each indicator reflects a DA-level social determinant of health. For example, higher rates of low income or unemployment indicate greater material deprivation; higher educational attainment or housing ownership reflects socioeconomic advantage. These values can be linked to health outcomes to study inequalities and inform interventions.

* 1. **Based on the literature and your experience working with this indicator/model, is it possible to identify weaknesses in its calculations or assumptions? To facilitate your answer, you can focus on:**

1. **Potential biases**
2. **Overestimation**
3. **Underestimation**
4. **Omitted variables**
5. **Endogeneity**
6. **Datasets’ problems**

* **Bias from interpolation:** assumes linear change between censuses, which may lead to misestimation of trends.
* **Boundary harmonization:** areal-weighted methods assume uniform population distribution.
* **Data suppression:** small DAs (<40 people) suppressed by Statistics Canada, leading to missing values.
* **Census limitations:** NHS 2011 was voluntary, potentially introducing response bias.
* **Binary sex/gender reporting:** Census DA-level data limits gender diversity representation.

1. **Does the indicator/model have other mathematical or computational versions (not syntax) to build it? (provide references)**

Yes. Several deprivation indices exist (e.g., CIMD,[(Statistics Canada, 2023)](https://paperpile.com/c/LkxR24/u3xN) On-Marg,[(Public Health Ontario, 2018)](https://paperpile.com/c/LkxR24/aHRG) Can-Marg,[(Matheson et al., 2021)](https://paperpile.com/c/LkxR24/hevq) Pampalon Index,[(Pampalon et al., 2012)](https://paperpile.com/c/LkxR24/DKgC) VANDIX).[(Bell & Hayes, 2012)](https://paperpile.com/c/LkxR24/dnpC) However, they are composite indices, whereas CASDOHI retains individual indicators for flexibility.

* 1. **Why are you building the indicator/model as you propose? Are there advantages compared to other versions?** CASDOHI builds on deprivation indices but avoids oversimplification into composite scores. It provides harmonized, ready-to-use indicators at the DA level, supports longitudinal analysis (2011–2021), and allows flexible aggregation and linkage to health data.

1. **Do you see potential improvements for the indicator/model? This could involve using other datasets, refining calculations, or modifying assumptions, among others.**

* Apply advanced interpolation techniques (population-weighted, dasymetric).
* Expand to include Market Basket Measure (MBM) poverty indicators once available.
* Improve gender inclusivity once census releases allow for more detailed reporting.
* Link with other datasets (e.g., health service utilization, environmental indicators).

**What inputs are to be added to CSDUL? Write “X”**

| **Publicly available on the Statscan website** | Raw or intermediate datasets required to create the indicator/model. |
| --- | --- |
| **X** | Codes that create the indicator/model (be sure that your code is clear enough to be replicated in the future for yourself or any other researcher). |
| **X** | Documentation that explains step by step the entire process that builds the indicator or model. |
| **X** | Results, which consist of the list of variables, indicators, or model results. |
| **X** | Support files. They can be papers, chapter books, codes, etc. |

**References**

[Bell, N., & Hayes, M. V. (2012). The Vancouver area neighbourhood deprivation index (VANDIX): A census-based tool for assessing small-area variations in health status. *Canadian Journal of Public Health. Revue Canadienne de Sante Publique*, *103*, S28–S32.](http://paperpile.com/b/LkxR24/dnpC)

[Matheson, F. I., Smith, K. L. W., Moloney, G., & Dunn, J. R. (2021). *2016 Canadian marginalization index: user guide*.](http://paperpile.com/b/LkxR24/hevq) <https://www.ontariohealthprofiles.ca/onmarg/userguide_data/CAN-Marg_user_guide_2016.pdf>

[Pampalon, R., Hamel, D., Gamache, P., Philibert, M. D., Raymond, G., & Simpson, A. (2012). An area-based material and social deprivation index for public health in Québec and Canada. *Canadian Journal of Public Health. Revue Canadienne de Sante Publique*, *103*(8 Suppl 2), S17–S22.](http://paperpile.com/b/LkxR24/DKgC)

[Public Health Ontario. (2018). *2016 Ontario Marginalization Index User Guide*. Public Health Ontario.](http://paperpile.com/b/LkxR24/aHRG) <https://www.publichealthontario.ca/-/media/documents/u/2018/userguide-on-marg.pdf?la=en>

[Statistics Canada. (2012, February 8). *Census Profile – Comprehensive download files for a selected geographic level: CSV or TAB*. Statistics Canada.](http://paperpile.com/b/LkxR24/cIw4) <https://www12.statcan.gc.ca/census-recensement/2011/dp-pd/prof/details/download-telecharger/comprehensive/comp-csv-tab-dwnld-tlchrgr.cfm?Lang=E#tabs2011>

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[Statistics Canada. (2023). *The Canadian Index of Multiple Deprivation: User Guide, 2021* (No. 45200001). Statistics Canada.](http://paperpile.com/b/LkxR24/u3xN) <https://www150.statcan.gc.ca/n1/pub/45-20-0001/452000012023002-eng.htm>