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What holds us together? Measuring dimensions of social cohesion in Canada

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Abstract. Social cohesion is a multi-dimensional concept referring to social connectedness, or the 'glue' that connects members of a society through bonds of solidarity and trust, within and across communities and organizations, and within society at large. The concept of social cohesion continues to garner interest in public and policy circles, perhaps reflecting the intuitive appeal of the concept and the role that cohesion can play in societies' abilities to respond to challenges, to function effectively, and to support rewarding lives. As a latent concept that is not directly observable or measurable, social cohesion is often measured through key dimensions. In this context, a dimension refers to a constituent part of social cohesion. Using factor analysis and data from Statistics Canada's 2020 General Social Survey on Social Identity, this study identifies nine key dimensions of social cohesion. Latent class modelling is then used to sort respondents into three latent classes or groups ("Low", high "Confidence-Belonging" and high "Trust-Participation" cohesion groups) of individuals that share common traits and prioritize certain dimensions of social cohesion. The probabilistic classification of individuals in accordance with latent classes provides valuable insights into social sorting mechanisms and how this extends to cohesiveness within Canadian society.

Keywords: Social cohesion, factor analysis, latent class analysis, socio-demographic disaggregation

1. Introduction

Social cohesion generally refers to social connectedness, solidarity and trust amongst individuals, within and across communities and organizations, and within society at large. While there is no single definition of the concept, it is generally understood to measure the strength of the bonds between societal members – or, alternatively, the weakness of these bonds.

Social cohesion acts as a valuable barometer of the fabric or 'glue' that connects members of society. Identifying low cohesiveness or social fragmentation, which carry negative societal consequences, has garnered substantial attention in the last two decades. The erosion of social ties [1,2], lower trust in institutions [3,4], higher inequality and reduced social mobility [3,5], among other occurrences, all have the potential to challenge individuals' unity and solidarity.

Given social cohesion's role in holding societal members together, the concept can provide a useful analytical lens to study emerging social trends. In contrast, if not concisely defined, the concept of social cohesion can serve as an all-encompassing term that obscures crucial differences in cohesiveness across dimensions and subpopulations. Delimiting the concept's scope using survey data and its implications across different population groups are key contributions of this article.

This study, expanding upon prior work within the context of an in-depth review on social cohesion for the United Nations Economic Commission for Europe [6], empirically identifies distinct dimensions of social cohesion. In this context, a dimension refers to a constituent part of social cohesion. The article addresses two main research questions: (1) What dimensions of social cohesion can be empirically identified using Canadian social surveys? (2) What household characteristics correlate with higher or lower social cohesion, and how does this vary across identified dimensions of social cohesion?

This study is divided into six additional sections. The first provides an overview of seminal scholarship on so-

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cial cohesion. The next section explores existing frameworks and the characteristics of contemporary definitions of social cohesion. The third additional section covers details about the social survey data used in this study. The subsequent section identifies key dimensions of social cohesion using factor analysis. The following section uses latent class modelling (LCM) to study groupings of individuals with varying levels of social cohesion and the disaggregation of constituent member characteristics. Finally, the last section provides concluding remarks and discussion points for future research on social cohesion.

2. Broadly defining social cohesion

Social cohesion broadly refers to the strength of bonds or social distance between societal members. The concept of social cohesion has evolved since early sociological and psychological scholarship.

The concept can be traced back to Émile Durkheim, one of the architects of modern sociology [7]. Durkheim defined social cohesion as the interdependence or solidarity between individuals with strong social bonds and without social conflict [8]. Similarly, the seminal work of Tönnies contrasting "community" (as defined by shared physical space, beliefs and norms) and "society" (based on self-interest for membership) lays foundational principles for studying cohesion within communities [9]. Building on these concepts in the 1950s, Talcott Parsons "argued for a functionalist approach, which could treat society as a system, composed of interdependent subsystems, held together by shared values reproduced by socialisation" [10].

In psychoanalysis and social psychology, Sigmund Freud studied emotional ties, or emotional commitment, as the phenomenon whereby individuals that share common characteristics form emotional ties [8]. Building on similar notions, Lott and Lott defined social cohesion as reciprocal positive attitudes among individuals of a group [11].

In contrast, Allport theorized that common characteristics were not only unnecessary, but that intergroup contact could foster cohesion [12]. His contact hypothesis posited that intergroup contact reduces prejudice and fosters co-operation, provided conditions such as equal status and shared goals. The notion that social cohesion is not dependent on homogeneity across individuals is echoed in the current understanding of cohesiveness, which emphasizes homogeneity in values, trust, sense of belonging, social participation, socio-economic opportunities, social mobility, and social capital [3,8,10,13–22] over the homogeneity of individual characteristics.

The past two decades of research on social cohesion mark a departure from earlier writings in terms of its increasingly pluralistic approach, instead focusing on defining cohesion through measurable facets, or dimensions. In particular, policy research on social cohesion has been highly influential in its attempts to explicitly define social cohesion through select dimensions that are empirically measurable [15], specifically focusing on socio-economic disparities and social exclusion [3,13,14,21]. For example, the Council of Europe's approach to social cohesion emphasizes a society's ability to ensure individuals' well-being, minimize disparities and avoid marginalization [23].

Overall, a plurality of definitions and applications of the concept of social cohesion has been advanced by international organizations, national governments and academic researchers. The next section focuses on more contemporary definitions of social cohesion through a list of constituent parts or measurable dimensions [15, 18].

3. Contemporary analysis of social cohesion

The concept of social cohesion has evolved since early sociological and social psychology scholarship on the topic. As discussed in the previous section, the contemporary literature is more pluralistic than earlier scholarship, focusing on the various facets of social cohesion being defined across multiple dimensions that are easier to empirically measure. In this context, a dimension refers to a constituent part of social cohesion. Moreover, social cohesion is a multi-level concept, meaning it varies across individuals, but also various aggregation of individuals (e.g., groups, communities, institutions, regions). Finally, beyond differences in academic studies of social cohesion, various national approaches to social cohesion warrant mention to explore lessons learnt across regional and temporal contexts.

3.1. Dimensions of social cohesion

Social cohesion is a latent concept because it is not directly observable or measurable. Social cohesion must instead be measured via its constituent dimensions. Further, these dimensions are often themselves latent concepts (e.g., social capital, social inclusion) that must be measured using multiple indicators [5,25]. This necessi-

tates the development of sizeable frameworks comprising multiple dimensions, each comprising constituent indicators.

Social cohesion experienced renewed attention in policy and academic circles from the mid-1990s. Jenson outlines five dimensions that juxtapose cohesive and non-cohesive factors [10]. These dimensions include: belonging versus isolation, inclusion versus exclusion, participation versus non-involvement, recognition versus rejection, and legitimacy versus illegitimacy. Bernard later added equality versus inequality as a sixth dimension [13]. Rajulton, Ravanera and Beaujot later adapted this multi-dimensional conceptualization into three categories: economic (inclusion and equality), political (legitimacy and participation) and social (recognition and participation) [16].

Drawing on more recent work, the OECD provides a social cohesion framework comprised of three broad dimensions: social capital, which includes trust in institutions, civic engagement, perceptions of corruption and social norms; social inclusion, which includes poverty and inequality; and social mobility, which includes the degree to which people can or believe they can change their position within society [3]. The framework includes both objective and subjective indicators. As another example, the Ipsos Social Cohesion Index combines several metrics as they relate to social relations (trust in people, shared priorities, diversity), connectedness (identity, trust in government, fairness), and focus on the common good (helping others, respecting laws, corruption) [26]. As explored in this study, several forms of discrimination (e.g., ethnicity, age, religious, sexual orientation) may also feature as elements of social cohesion, either as sub-components of dimensions such as social inclusion and recognition or as dimensions of their own.

Though definitions of the constituent dimensions of social cohesion vary, there are recurrent themes within the literature [8]. As an unobservable (i.e., latent) variable, social cohesion can manifest itself in the form of higher confidence in institutions, interpersonal trust, sense of belonging, sense of inclusion or exclusion, solidarity, social and political participation, and distance in terms of shared values, among other factors [3,8,10,13–20,22].

The relationships between dimensions of social cohesion and their position within theoretical models remain contested. Friedkin describes the study of social cohesion as "increasingly confused" due to difficulties in reconciling numerous competing dimensions that "occupy different theoretical positions with respect to one another as antecedent, intervening, or outcome variables" [27]. For instance, in their literature review, Schiefer and van der Noll identify social relations, sense of geographical belonging, orientation towards the common good, (in)equality, quality of life, and shared values as six of the most common dimensions of social cohesion in the literature, but drop the latter three dimensions, which they interpret as antecedents or consequences of social cohesion as opposed to dimensions *per se* [28]. Similarly, Chan, To and Chan argue that social cohesion be measured through three dimensions: trust, sense of belonging, and the willingness to participate and help [15].

Beyond the absence of a consensus in defining social cohesion, the vast number of potential dimensions complicate the search for relevant data. The following section describes the social survey data used in this study.

3.2. A multi-level concept

Social cohesion is a multi-level concept. This means that cohesiveness, or the 'glue' that binds societal members, involves the study of attitudes, behaviours and outcomes of individuals, groups, communities, institutions, and larger groupings such as countries. The interaction between these levels of analysis is a further consideration.

Determining the unit of analysis is of critical importance given differences in context and cohesiveness across levels. For example, measures of cohesiveness at a municipal versus state level, or for specific groups versus the broader population, may differ greatly. Moreover, different jurisdictions may focus on different dimensions and levels of analysis based on their regional context as discussed in the following sub-section. Authors such as Duhaime et al. divide social cohesion into two dimensions (economic and government conditions, and social and community ties) based on societal and interpersonal levels of analysis [29]. Others have argued that social cohesion frameworks are better framed in terms of relevant levels of analysis, the several "connections and interdependencies between individuals, the community and institutions", and that frameworks be "designed to be extensible" to include various dimensions based on the analytical context (as opposed to a prescriptive list of dimensions) [8].

One simple but potentially helpful categorization is a two-by-two matrix that categorizes dimensions across horizontal (i.e., society-centred) and vertical (i.e., state-centred) levels of analysis, with both split into subjec-

tive and objective components [15,24]. This simple conceptualization emphasizes the importance of integrating the study of various dimensions of social cohesion across different levels of analysis.

Some authors argue that social cohesion is only measured at the societal level and should not be measured at the individual since "social inclusion" is instead considered an "isomorphic concept of social cohesion at the individual level" [18]. The concept of social cohesion should be distinguished from similar concepts, such as social inclusion [5] and social capital [20,25], which are similarly defined, as well as equally complex and multi-faceted concepts. The differentiation between concepts is complicated by conceptual overlaps, empirical inter-relationships between concepts, and the lack of consensus in defining each concept [5,25].

For the purposes of this article, social cohesion focuses more specifically on the strength of the bonds between individuals, various groups, and societal institutions. While social inclusion and exclusion concepts are by design measured as a scale ranging from inclusion on the one end and exclusion on the other, social cohesion focuses more specifically on the relative distance between a specific individual and other individuals, groups, and institutions. The latent class modelling employed in this article is a good example of studying cohesion through a lens of relative distance between social groupings (i.e., social sorting) as opposed to metrics ranging from inclusion (i.e., desirable) to exclusion (i.e., undesirable).[1]

3.3. Context and frameworks across countries

Contextualization is key, given the dynamic nature of social cohesion across geographies and time. For example, in the United States, social mobility features prominently in discussions of social cohesion [3], while greater emphasis is placed on dimensions such as participation and trust in the Netherlands [5,30]. Various national frameworks, each reflecting their specific contexts, dimensions, and units of analysis, exist. This subsection provides an overview of select frameworks that arose under a range of different circumstances and provides a glimpse into the range of issues of interest when studying the topic of social cohesion.

[1] While several dimensions within the factor analysis provide less clarity in delineating between social cohesion and social inclusion concepts, dimensions such as shared values more closely align with the relative distance conceptualization of social cohesion than concepts of inclusion or exclusion.

In Canada, social cohesion is an important part of the Quality of Life Framework as defined in 2020/2021 through meetings and consultations led by the Department of Finance Canada and publicly released in Budget 2021 [31]. Within the Quality of Life Framework, "social cohesion and connections" includes key indicators such as sense of belonging to the local community, having someone to count on, trust in others, volunteering, satisfaction with personal relationships, loneliness, and the accessibility of one's environment. This framework draws from prior work on social cohesion conducted by Heritage Canada in the late 1990s and early 2000s in which social connections and belonging, cultural and national identity, political participation, and economic inclusion were key themes [14]. Within the Canadian context, there also tends to be a focus on Indigenous people and diversity issues as areas of shared values and the analysis of discrimination (refer to Table 1).

Although not a national framework, the European Committee for Social Cohesion, with members designated by Council of Europe members, is mandated to provide analysis and recommendations and promote dialogue regarding social cohesion [32]. Like its predecessor, the European Social Cohesion Platform, the European Committee for Social Cohesion facilitates dialogue and exchange of best practices among member states on issues, such as social cohesion, poverty eradication and minimum income programs, that are relevant to the promotion of social rights [32]. In 2005, the Council of Europe developed a comprehensive methodological guide for defining and measuring social cohesion [23]. The guide provides insights and contrasts the approach to social cohesion adopted by the Council with competing alternatives. Social cohesion is defined "[. . .] as the ability of a society to ensure the welfare of all its members, minimising disparities, and avoiding polarisation" [23].

In the United Kingdom, the Community Cohesion Review Team developed the concept of 'community cohesion' in 2001. The 'Cantle report' produced by this team outlined the existence of "parallel lives" across different communities, offering a critique of multiculturalism whereby large groups (namely, "White British" and "Asian" people) live separate lives with little interaction and, in turn, diminished opportunities for the development of shared values [33]. The report outlines several dimensions of community cohesion, including common values and civic culture, social order and social control, social solidarity and reduction in wealth disparities, social networks and social capital, and place

attachment and identity [33]. One of the report's key recommendations was to advocate for 'contact theory,' whereby exposure to different groups and increased interaction can bridge gaps between groups. Cantle suggests that community cohesion "offers a new framework to break down the barriers between different communities and understand the more fundamental causes of racism and the 'fear of difference"' [34]. Several initiatives to mainstream community cohesion in the United Kingdom followed [35].

While interest in social cohesion began in New Zealand in the early 2000s [36], the March 2019 Christchurch mosque attacks prompted renewed attention to the approach. The *Royal Commission of Inquiry into the Terrorist Attack on Christchurch Masjidain on 15 March 2019* posits that "societies that are polarized around political, social, cultural, environmental, economic, ethnic or religious differences provide conditions in which radicalising ideologies develop and flourish" [37]. The inquiry report states that "social cohesion is desirable for many reasons, one of which is that it is critical to preventing the development of harmful radicalising ideologies and downstream violent extremism". While the report offers a narrower version of social cohesion focused on reducing extremist violence, it revolves around common cohesiveness concepts such as a sense of belonging, social inclusion, participation, recognition, and legitimacy. New Zealand emphasizes Indigenous rights in its definition of social cohesion given "the context for creating a socially cohesive society in Aotearoa New Zealand is underpinned by Te Tiriti o Waitangi, Te Ao Māori perspectives and the Māori-Crown relationship" [37].

In Australia, the Department of Home Affairs lists social cohesion as one of its main functions, primarily built around shared values, multiculturalism, and an inclusive national identity [38]. The Australian Human Rights Commission, an independent statutory organization established by an act of the Australian Federal Parliament, provides a resource guide to building social cohesion within local communities [39]. Within the guide, the first step includes measuring social cohesion and recommends using a benchmark such as the Scanlon-Monash Index. The Scanlon-Monash Index comprises five dimensions: sense of belonging, sense of worth, social inclusion and justice, political participation, views on discrimination, immigration and traditions and optimism about the future [40].

4. Data

Statistics Canada's 2020 GSS on the theme of Social Identity (Cycle 35) covers data pertaining to several dimensions outlined in the literature on social cohesion. The 2020 GSS included an oversample of selected population groups identified in Canada's Employment Equity Act.[2] Interviews were conducted using computer-assisted telephone interviews and electronic questionnaires, with an overall response rate of 40.3%.

The context in which the survey was administered is vital to interpret results appropriately. The 2020 GSS data – collected between August 2020 and February 2021 – should be interpreted within the context of the COVID-19 pandemic. Given that several social cohesion dimensions were likely impacted by social distancing, isolation, and other pandemic-related health measures, the results may mirror those of other social and well-being studies whereby vulnerable individuals (e.g., younger individuals) were disproportionately affected during this period [41–43].

This paper's focus is on the social dimensions of cohesiveness rather than socio-economic dimensions such as economic inequality, poverty, and social mobility [3]. Of particular interest are those 2020 GSS variables that fall under the broad umbrella of social cohesion as they pertain to the dimensions of legitimacy, belonging, social capital, social participation, and shared values. While including socio-economic dimensions would be valuable, no other survey or combination of data sources provided both socio-economic variables and the detailed social dimensions captured within the 2020 GSS.

At the outset, 60 2020 GSS variables that fell under the umbrella of social cohesion were considered in factor analysis and latent class modelling. Using factor analysis, this number reduces to 43 variables with high response rates and load strongly onto the exploratory factor model. The following section describes this process in greater detail.

5. Factor analysis of social cohesion dimensions

A multi-dimensional approach is key to capturing the many facets of social cohesion. While there are bene-

[2]The GSS asked respondents to identify their population group, which included categories for White, South Asian, Chinese, Black, Filipino, Arab, Latin American, Southeast Asian, West Asian, Korean, Japanese and other.

fits to the analytical depth permissible when narrowly studying a single dimension of social cohesion, this first section focuses on the broader identification of dimensions and their interactions. Therefore, the emphasis is on concurrently analyzing dimensions to better understand the relationships between these social cohesion dimensions.

This however poses a challenge. As the number of dependent social cohesion variables increases, the number of correlations within the set of social cohesion variables and their relationships to other variables of interest (e.g., socio-demographic variables) increases at a faster rate. Analytical methods employing dimension reduction are therefore necessary to balance the parsimony and interpretability of results with the intrinsically multi-dimensional aspect of the research.

Factor analysis is a statistical method that is well suited for this task. Factor analysis models observed and correlated variables in a dataset in terms of a lower number of unobserved variables called factors. Each variable in the data is modelled as a linear combination of unobserved factors plus an error term, with coefficients referred to as factor loadings. Factor loadings describe the magnitude of the relationship between each factor to the observed variable.

More formally, factor analysis aims to model the overall variability in a dataset by identifying groups of variables whereby the correlation of variables in that group is higher than with out-group variables, and postulates that each of these groups can be described with a single latent variable, the corresponding factor, without substantial loss of information. In this way, factor models can substantially reduce the number of variables in a dataset while preserving the variability across observations and has the potential to produce meaningful factors that can be understood in terms of the observed variables.

For each variable x_s in the data with mean μ_s, the factor model assumes that x_s can be represented by:

$$x_s - \mu_s = \sum_{i=1}^{k} l_{i,s} f_i + \varepsilon_s$$

Where $x_s - \mu_s$ is the mean-adjusted observed vector; $l_{i,s}$ is a scalar coefficient (called the factor loading of variable s onto factor i); f_i is the i^{th} factor; and ε_s the corresponding error term. The number of factors k is determined exogenously, and can be identified with any number of criteria, often utilizing the variance-covariance matrix of the data itself. The derivation of the matrix of factor loadings $l_{i,s}$ is usually of interest, as they represent the strength of the relationship between each observed variable and each unobserved factor. Factor loadings with magnitude less than 0.3 are typically treated as extraneous to that factor, and variables with a factor loading above this threshold for a given factor are said to load onto that factor.

In practice, conducting a factor analysis typically involves two steps. First, an exploratory factor analysis (EFA) is conducted on the data and aims to generate an initial factor model, identifying the appropriate set of variables to include, the correct number of factors, and identifying which variables correspond to which factors (via factor loadings). Second, a theoretical model is constructed based on the results of the EFA (taking into consideration extraneous factor loadings) and subjected to confirmatory factor analysis (CFA), which measures the goodness of fit of the hypothesized model to the data.

Starting with the complete set of 60 variables identified as relevant for this analysis, an iterative EFA was carried out in three stages. First, the appropriate number of factors was determined using the Kaiser-Guttman criterion [44,45] on the polychoric correlation matrix of the data. Second, the correlation matrix was used to calculate a factor model, yielding both the matrix of factor loadings and a vector of uniqueness measures (corresponding to the amount of variance unexplained by the factor model). Third, variables were dropped from the model if they exhibited a high proportion of non-responses, if their uniqueness was higher than 0.8 (i.e., the model explained less than 20% of the variation in the variable), or if no factor loadings exceeded the 0.3 threshold. This iterative process was considered complete when no remaining variables were eliminated based on these criteria.[3]

Table 1 presents the factor loadings for the resulting exploratory factor model. The iterative process described above results in 17 of the 60 variables being

[3]This process removes variables pertaining to social ties (e.g., friends of different backgrounds, number of close friends and relatives), membership and involvement in groups (e.g., religious, sports), and questions asking about general trust of others and trust of family members. Dropping these variables relating to social capital [3] and social participation [16,46] differs from other studies treating these as dimensions of social cohesion. Remaining variables pertain to confidence in institution, trust in others, experiences of discrimination or unfair treatment, electoral participation, sense of belonging, perceived value differences (between the respondent and Canadian society at large), and neighbourhood aspects. However, it should be noted that dropping these variables in the initial stages of the analysis does not necessarily mean that these variables are not relevant regarding social cohesion, nor does it imply that other datasets or methods of analysis would yield the same results.

Table 1
Exploratory factor analysis (EFA) factor loadings by GSS variable

GSS variable	Factor 1 Confidence in institutions	Factor 2 Trust	Factor 3 Discrimination A	Factor 4 Electoral participation	Factor 5 Geographic belonging	Factor 6 Discrimination B	Factor 7 Shared values	Factor 8 Identity belonging	Factor 9 Neighbourhood links
Confidence – Federal parl.	0.83								
Confidence – Justice system	0.80								
Confidence – School system	0.75								
Confidence – Banks	0.73								
Confidence – Corporations	0.70								
Confidence – Police	0.67								
Confidence – Media	0.66								
Confidence – Small business	0.47	0.33							
Pride – Democracy	0.47				0.31				
Pride – Diversity	0.41								
Trust – Other ethnicity		0.94							
Trust – Other religion		0.93							
Trust – Other language		0.90							
Trust – Neighbours		0.61							0.33
Trust – Strangers		0.55							
Discrimination – Gender id. or exp.			0.77						
Discrimination – Sexual orientation			0.72						
Discrimination – Sex			0.67						
Discrimination – Phys. Appearance			0.62			0.37			
Discrimination – Disability			0.63						
Discrimination – Age			0.61						
Discrimination – Ethnicity						0.91			
Discrimination – Skin colour						0.80			
Discrimination – Language						0.70			
Discrimination – Religion						0.66			
Voted in last provincial elect.				0.97					

Table 1, continued

GSS variable	Factor 1 Confidence in institutions	Factor 2 Trust	Factor 3 Discrimination A	Factor 4 Electoral participation	Factor 5 Geographic belonging	Factor 6 Discrimination B	Factor 7 Shared values	Factor 8 Identity belonging	Factor 9 Neighbourhood links
Voted in last federal elect.				0.94					
Voted in last municipal elect.				0.92					
Intend to vote in next federal				0.70					
SBL – Town or city					0.88				
SBL – Local community					0.78				
SBL – Province					0.72				
SBL – Canada	0.32				0.58				
SBL – Same language								0.83	
SBL – Same ethnicity								0.82	
SBL – Same religion								0.74	
Value diff. – Indigenous cultures							0.82		
Value diff. – Ethnic/cult. diversity							0.80		
Value diff. – Gender equality							0.69		
Value diff. – Human rights							0.56		
Neighbours – Ask for favour									0.80
Neighbours – Number known									0.73
Neighbours – Helpful									0.63
Proportional Variance	0.12	0.08	0.08	0.08	0.07	0.07	0.06	0.05	0.05
Cumulative Variance	0.12	0.20	0.28	0.36	0.43	0.49	0.55	0.60	0.65

SBL – Sense of belonging. Source: Statistics Canada, General Social Survey 2020.

removed from the analysis, and yields a nine-factor model that explains 64.3% of the total variance across the remaining 43 variables. Factor loadings presented in Table 1 quantify the magnitude of the relationship between each variable and the corresponding factor, and range from -1 to 1. Loadings close to 1 or -1 for a variable-factor pair indicate strong positive/negative loading onto that factor, and loadings close to 0 (between 0.3 and -0.3) are suppressed and considered extraneous. Factors are presented in order of decreasing proportional variance, with Factor 1 explaining the greatest proportion across all variables.

The resulting factors, though referred to as dimensions for simplicity and ease of presentation, could instead constitute antecedents or other correlates of social cohesion as several studies have pointed out [15,27,28]. As such, the factors are not intended to be a prescriptive list of social cohesion dimensions.

Confidence in institutions (Factor 1), explaining the greatest share of variance overall, suggests that it is a key dimension of social cohesion. Confidence in Canada's federal parliament, the justice system and

courts, schools, banks and major corporations ranged from 0.70 to 0.83. This aligns with prior research outlining confidence in institutions as a dimension of social cohesion [10,13,16–18,30], although prior research occasionally regroups common values (Factor 7) and common civic culture (Factor 1) [19,20]. Factor loadings for confidence in the Canadian media and police were slightly lower, at around 0.67, while the factor loading on confidence in local merchants and business people was relatively low (0.47). Pride in diversity and in the way democracy works in Canada also loaded onto confidence in institutions (Factor 1), albeit at weak levels (0.41 and 0.47, respectively), with pride in democracy weakly loading onto geographic sense of belonging as well (Factor 5).

The factor explaining the second highest share of variance is trust, specifically trust in so-called "out group" members such as strangers and people with different linguistic, religious or ethnic backgrounds. This dimension resembles dimensions of openness [18] and interpersonal trust [15,18,30,47] in other studies of social cohesion. However, it focuses more specifically on affective sentiments towards individuals outside one's immediate entourage. Questions pertaining to trust of people with the same or different ethnicity, religion and language loaded strongly onto Factor 2, each with a factor loading of 0.9 or higher. The trust of strangers and trust of neighbours loaded onto this factor as well, but with values of 0.55 and 0.61, respectively

The factor model splits experiences of discrimination into two distinct groups each. The division of experiences of discrimination between Discrimination A (Factor 3 pertaining to elements of age, sex, physical appearance, disability, sexual identity and gender identity) and Discrimination B (Factor 6 pertaining to ethnicity, skin colour, language and religion) is noteworthy, and suggests that the model identifies experiences in these two groups as being distinct. Experiences of discrimination or unfair treatment on the basis of age, sex, physical appearance, disability, sexual identity and gender identity loaded onto Factor 3, with factor loadings generally ranging from 0.61 to 0.77. Both discrimination groups are comparable dimensions to recognition, equality and inclusion in the social cohesion literature [10,13,16].

Electoral participation (Factor 4) serves as a narrower measure of social participation [14,17,30], which several researchers deem an important dimension of social cohesion and a source of social interconnectedness [16,18,46]. However, in contrast with certain authors, electoral participation does not load onto civic culture (i.e., confidence in institutions) and shared values [19,20]. While group membership variables were excluded based on the exclusion criteria of this study, questions pertaining to participation in the prior federal, provincial and municipal elections all have factor loadings above 0.9. Respondents' intentions to vote in the next federal election also loaded on Factor 4, with a factor loading of 0.7.

Sense of belonging, like discrimination, is similarly split into two distinct factors: geographic or local belonging (Factor 5) and identity-based belonging (Factor 8). Although often grouped under a broader sense of sense of belonging, this split aligns with prior research [19,20]. Factor loadings were stronger for variables pertaining to the local level, that is, sense of belonging to the municipality (0.88) and one's local community (0.78), than for variables pertaining to broader entities, specifically, their province (0.72) and to Canada (0.58). In contrast, sense of belonging to identity groups (Factor 8), especially along ethno-cultural, religious or linguistic lines, have loadings ranging from 0.74 to 0.83. While past research has typically not split the sense of belonging into two groups, sense of belonging is a well-documented dimension of social cohesion [10,13–15].

Shared values (Factor 7) is another identified social cohesion dimension [14,19,20]. Based on 2020 GSS responses about agreement with values such as gender equality, respect for Indigenous culture, ethnic and cultural diversity, and human rights, 'value distance' is measured as the difference between their personal views and their perceived societal view. This captures the degree to which individuals felt their views were congruent or incongruent with the broader Canadian population. These four 'relative issue importance,' or 'shared values,' variables load onto Factor 7, with factor loadings on relative importance attached to respect for Indigenous culture and ethnic and cultural diversity of 0.8 or more.

The ninth factor identified pertains to peoples' social ties and assessments of their neighbours and neighbourhoods. Questions regarding social contacts, helpfulness and reciprocity with neighbours load onto this factor, with factor loading ranging from 0.63 to 0.8. These variables align with previous research tying social cohesion to social capital and social ties [3,18].

Building on the EFA's intuitive results, a CFA validates the exploratory results by assigning each group of variables to a dedicated factor. Appendix Table 1A presents the factor scores produced by the confirmatory factor model. It shows the final structure assigned to the model. The CFA indicates that this model is a good

fit to the data[4] and produces factor loadings similar to those produced in the exploratory factor model, except for pride variables.[5] This final set of factor loadings and the polychoric correlation matrix are used to calculate factor scores for each respondent across the nine factors. Although some variables load onto more than one factor with loadings exceeding 0.3, these loadings are relatively small (i.e., under 0.35) and are not identified in the CFA model for brevity. Empty cells indicate that a variable is not assigned to that particular factor.

6. Latent class analysis

Factor models are a useful tool for understanding the underlying structure of variability in a dataset. In the previous section, factor analysis identified nine factors of social cohesion from the 2020 GSS where each factor can be thought of as condensing a set of highly correlated variables into a single representative factor. This is useful for the purposes of understanding social cohesion in a multi-dimensional framework but is restricted to identifying patterns across variables and not across observations.

As this study is interested in socio-demographic and household characteristics that may be coincident to varying levels of social cohesion, LCM is also employed to complement the factor analysis conducted above. Latent class models are a subset of structural equation models that relate observations in a dataset to a set of underlying latent classes. Whereas factor analysis models each variable as a linear combination of the underlying factors, latent class models identify patterns between variables and observations via maximum likelihood estimation (MLE) of a non-parametrized model.

In the resulting classification the manifest variables are assumed to be statistically independent conditional on class membership so that observable patterns and correlations within a class are understood as resulting from their class membership. As the model is estimated using MLE, classification of observations in the data is probabilistic so that each observation is assigned a vector of probabilities of class membership to each of the g classes. LCM treats patterns in manifest variables as being "symptomatic" of membership to one of g latent classes with the number of classes g being determined exogenously.

More formally, the probability that an observation i with responses y_i belongs to class g is modelled by:

$$f(y_i|g) = \prod_K \prod_{O_k} p_{o,k,g}^{\delta_{i,o,k}}$$

where $k \in K$ indexes the manifest variables; $o \in O_k$ indexes the possible values for manifest variable k; $p_{o,k,g}$ is the probability that a randomly selected observation has the value o in variable k in class g; and $\delta_{i,k,o}$ is the Dirac delta function equal to 1 when observation i has value o in variable k and 0 otherwise. Taking the sum of this product over the classes $g \in G$ yields:

$$f(y_i|p,\gamma) = \sum_G \gamma_g \left[\prod_K \prod_{O_k} p_{o,k,g}^{\delta_{i,o,k}} \right]$$

with the parameters of interest p, γ being derived via likelihood maximization.

Latent class modelling has several advantages over data clustering methods, which although similar to LCM differ in several important ways. LCM is non-parametric and estimates membership probabilistically using MLE, and for small number of classes ($g < 9$) were found to yield consistent results and achieve the same maximum likelihood for the estimator. Cluster algorithms in contrast are initialized with a random cluster specification and produce results that are dependent on initial conditions, requiring a larger number of trials to identify the best fit overall.

Discrete data cluster models such as the k-modes algorithm are also limited in that defining distance between observations and group centroids can be ambiguous for categorical data, although can be meaningful on binary data [48]. As latent class modelling does not identify group membership based on a distance metric, it can handle any number of discrete variables with many responses with relative ease, and is hence well suited for survey data

Latent class models however are limited in that they assign a discrete probability distribution of class membership to each observation rather than a single class, making the resulting classes "fuzzy".[6] The non-parametric nature of the model also means that the

[4] Root mean square error of approximation = 0.028; Comparative fit index = 0.986; Chi-squared test statistic = 17,376.4 on 822 degrees of freedom (p-value < 0.001).

[5] Variables pertaining to pride in Canada's democracy and pride in Canada's diversity loaded onto both Factors 1 and 5 with similar strength in the EFA model, indicating that these variables feasibly correspond to a linear combination of these two factors.

[6] More formally, if an observation has probabilities p_A and p_B of membership in classes A and B respectively with $p_A \simeq p_B$ then the observation can be thought of as a fringe case in either class A or class B, and is sorted into the class with the higher probability.

Table 2
Weighted mean of factor scores by latent class

Latent class	Confidence in institutions	Trust	Discrimination A	Electoral participation	Geographic belonging	Discrimination B	Shared values	Identity belonging	Neighbourhood links
1 – Low cohesion	−0.68	−0.52	0.30	−0.25	−0.34	−0.07	0.06	−0.13	−0.13
2 – Confidence -Belonging	1.31	0.12	−0.46	−0.29	0.26	−0.08	−0.27	0.32	−0.03
3 – Trust-Participation	−0.05	0.42	−0.03	0.38	0.17	0.14	0.11	−0.05	0.12

Note: Latent classes are identified using the underlying factor variables, not the factor scores from the factor analysis. The weighted means of factor scores (from CFA, see Appendix Table 1A) presented in this table are presented for illustrative purposes to draw linkages between both analyses. Source: Statistics Canada, General Social Survey 2020.

class determination process is a so-called "black box" in terms of retracing the role of each variable in determining class membership.

Using the same 43 observed variables that loaded strongly in the factor model in the previous section combined with a selection of socio-demographic and household variables of interest, a variety of different model specifications with different numbers of classes were produced. In keeping with best practices [49], the number of classes was identified on a model without the inclusion of socio-demographic covariates to avoid model misspecification. Once the appropriate number of classes was identified, covariates were re-incorporated so that latent classes could be identified along those features as well.

A 3-class solution was identified as yielding latent classes that easy to interpret and concise. Akaike and Bayesian information criteria both yielded lower values for a higher number of latent classes indicating a better fit of the model. However, it was observed that observations of a given class in the 3-class model tended to be sorted into similar groups of classes as a cohort when more classes were added to the model. These groupings could be identified for the 4 and 5-class models and did not necessarily yield a more intuitive explanation despite better information criteria. The 3-class model hence strikes a balance between objective goodness of fit measures and subjective interpretability.

The 3-class model yields classes which roughly correspond to a class exhibiting signs of lower cohesion (Class 1); a class with high confidence in institutions and high sense of belonging (Class 2); and a class with high trust in others and good neighbourhood connections (Class 3). The addition or omission of socio-demographic variables has little effect on the makeup and composition of the resulting classes. The labels "Low", "Confidence-Belonging", and "Trust-Participation" are given to these classes for descriptive purposes only and are not intended to be prescriptive.

Results from the model with socio-demographic variables included are presented here, with the "Low", "Confidence-Belonging" and "Trust-Participation" cohesion classes, making ups 36.7%, 28.5% and 34.8% of survey respondents, respectively. Table 2 presents average factor scores by latent class, with negative values indicating low adherence to the corresponding concept (e.g., lower trust, fewer reported experiences of discrimination) and positive values conversely indicating higher adherence.

The "Low" cohesion class has respondents who report lower than average confidence in institutions, trust in others, electoral participation, geographic sense of belonging, and neighbourhood ties. This group also sees close to average experiences of Discrimination B, value differences and identity sense of belonging, and sees fewer experiences on average with Discrimination A than both other groups.[7]

The "Confidence-Belonging" class consists of individuals who report the highest confidence in institutions and sense of belonging both for geographic belonging and identity belonging. Individuals in this group report close to average trust in others and neighbourhood ties, and the lowest scores for both Discrimination A and B (indicating more experiences with both), election participation, and value differences.

The "Trust-Participation" cohesion class consists of individuals who report higher than average values for trust in others, electoral participation, Discrimination B (indicating fewer experiences), value differences and neighbourhood ties. This third group has confidence in institutions and Discrimination A values that are in between those of the "Low" and "Confidence-Belonging"

[7] Although the "Low" cohesion class experiences fewer experiences of Discrimination A and close to average experiences of Discrimination B, this group contains most respondents experiencing discrimination across all types, although many such experiences are sparsely reported.

Table 3
Socio-demographic breakdown of three latent classes, percentage distribution by columns and rows

Concept	Categories	Column distributions			Row distributions		
		Class 1 – Low cohesion group	Class 2 – Confidence-Belonging cohesion	Class 3 – Trust-Participation cohesion	Class 1 – Low cohesion group	Class 2 – Confidence-Belonging cohesion	Class 3 – Trust-Participation cohesion
Age group	15–24	8.0	3.4	1.8	64.8	21.1	14.1
	25–34	17.2	9.1	7.4	55.0	22.6	22.4
	35–44	22.4	22.8	14.0	42.0	33.2	24.8
	45–54	18.5	21.2	16.3	36.7	32.6	30.7
	55–64	16.7	17.7	23.8	31.5	26.0	42.5
	65+	17.2	25.9	36.6	23.9	28.0	48.2
Sex	Female	47.2	43.4	54.7	35.6	25.4	39.0
	Male	52.8	56.6	45.3	37.8	31.5	30.7
Educational attainment	Less than HS	9.3	12.8	6.5	36.8	39.1	24.1
	HS Diploma	21.2	23.1	19.7	36.7	31.0	32.2
	Diploma/Certificate	29.0	25.6	36.7	34.7	23.8	41.5
	Bachelor or Higher	40.4	38.5	37.1	38.3	28.4	33.3
Income	0–30k	15.9	17.6	8.9	41.8	36.0	22.2
	30–60k	22.0	27.6	19.2	35.7	34.8	29.5
	60–100k	26.5	25.3	25.0	38.0	28.1	33.9
	100k+	35.5	29.5	46.9	34.5	22.3	43.1
Dwelling ownership	No	33.0	36.0	13.1	44.9	38.1	16.9
	Yes	67.0	64.0	86.9	33.7	25.0	41.3
Generation of immigrant	First gen	56.7	81.3	21.2	40.5	45.1	14.4
	Second gen	15.7	5.6	13.5	47.8	13.4	38.8
	Third gen or higher	27.6	13.0	65.3	27.8	10.2	62.1
Marital status	Married	41.0	57.9	58.6	29.0	31.8	39.2
	Common law	8.4	3.3	9.0	43.2	13.3	43.5
	Separated/Divorced	13.7	13.9	11.2	39.1	30.7	30.2
	Widowed	4.8	7.6	8.9	24.9	31.0	44.1
	Single	32.1	17.3	12.3	56.1	23.5	20.4
Region	Atlantic	7.2	7.3	26.2	19.2	15.1	65.7
	Quebec	25.7	22.8	17.1	43.1	29.7	27.1
	Ontario	38.6	44.1	27.1	39.2	34.8	26.0
	Prairies	17.2	15.6	20.5	35.3	24.9	39.9
	British Columbia	11.3	10.2	9.2	40.4	28.4	31.2
CMA/CA/Rural	CMA	88.7	89.5	63.4	40.6	31.9	27.5
	CA	5.9	6.2	16.2	22.7	18.6	58.7
	Rural	5.3	4.2	20.3	19.1	11.8	69.0
LGBTQ2S+	No	93.3	97.0	97.3	35.8	28.9	35.3
	Yes	6.7	3.0	2.7	57.6	20.2	22.2
Equity group	None	42.8	26.9	83.9	29.9	14.6	55.5
	Chinese	8.3	6.2	2.3	54.4	31.7	14.0
	E/SE Asian**	13.8	12.0	3.0	53.2	35.9	10.9
	South Asian	5.9	12.5	2.7	32.5	53.3	14.2
	West Asian	15.2	25.2	4.2	39.3	50.5	10.2
	Black	4.0	4.5	0.9	47.9	41.7	10.4
	Latin American	7.5	10.4	2.3	41.9	45.6	12.5
	Mixed/Other	2.5	2.3	0.7	50.5	36.2	13.3

**East and Southeast Asian other than Chinese (incl. Japanese, Korean, Filipino). CMA – Census Metropolitan Area CA – Census Agglomeration. Note: Columns and rows may not sum to 100% due to rounding. Source: Statistics Canada, General Social Survey 2020.

cohesion groups, and lower values for identity-based sense of belonging.

Turning now to the demographic distribution between groups in Table 3, the "Low" cohesion group has an overrepresentation of younger Canadians, with more than half of Canadians aged 15–35 being allotted to this group. Conversely, the "Confidence-Belonging" group has wide range of ages and the "Trust-Participation" group skews older, representing approximately 46% of respondents aged 55 or older.

The "Trust-Participation" group has a slightly higher representation of women than men (55% and 45% respectively), with these proportions roughly reversed for the "Low" cohesion and "Confidence-Belonging"

groups.

The "Trust-Participation" consists of a larger proportion of respondents reporting annual incomes of $100,000 or more compared to the other two groups. In contrast, the educational compositions of each group were fairly similar, with the main exception of a larger proportion of college diplomas or University certificates within the "Trust-Participation" group. Another smaller exception is the larger proportion of respondents reporting having completed less than high school within the "Low" cohesion and "Confidence-Belonging" groups. These patterns are reflected in homeownership across the three groups, with the "Trust-Participation" group having the highest rates of homeownership at 87%, compared to 64% to 67% for the "Confidence-Belonging" and "Low" cohesion groups.

The "Confidence-Belonging" group is mostly comprised of first-generation immigrants to Canada, who account for slightly more than 8 in 10 individuals in that group. Comparatively, 57% of the "Low" cohesion group, and 21% of the "Trust-Participation" group, reported being a first-generation immigrant to Canada. As for other immigration status groups, both individuals reporting being second generation or third generation or higher are relatively underrepresented within the "Confidence-Belonging" group.

The "Low" cohesion group contains an underrepresentation of married respondents relative other groups and an overrepresentation of single person households, with most single respondents appearing in the "Low" cohesion category. Married households make up just shy of 60% of the other two groups, and 41% of the "Low" cohesion group.

The "Trust-Participation" group has an overrepresentation of respondents living either in smaller cities/ towns or in rural areas. Respectively, 89% and 90% of the "Low" cohesion and "Confidence-Belonging" groups live in a Census Metropolitan Area (CMA), while a smaller proportion (63%) of the "Trust-Participation" group lives in a CMA. The majority of rural respondents and those living in a Census Agglomeration (CA) are categorized into this latter "Trust-Participation" group. Additionally, the "Trust-Participation" group has a noticeable overrepresentation of respondents in Atlantic provinces, with a majority of survey respondents from this region appearing in this group.

Respondents identifying as LGBTQ2+ are overrepresented in the low social cohesion group, making up around 7% of this group relative to roughly 3% for the other two groups. Among respondents identifying as LGBTQ2+, slightly over half (58%) appear in the "Low" cohesion group.

The "Trust-Participation" group has an underrepresentation of people not identifying as White, with 84% of respondents identifying as White compared to 43% for the "Low" cohesion group and 27% for the "Confidence-Belonging" group. Between the "Low" cohesion and "Confidence-Belonging" groups, more South Asian and West Asian (including Middle Eastern and Arab) respondents appear in the latter group. Individuals identifying as Chinese, East or Southeast Asian, Black, Latin American or Mixed represent relatively similar proportions of both groups.

Many of the patterns in responses to the social cohesion variables reflect their demographic compositions. The "Confidence-Belonging" group for instance is mostly comprised of first-generation immigrants to Canada, and exhibits low electoral participation, possibly due to a lack of registration or residency status. Higher reported experiences with discrimination falling under the category of Discrimination B in the "Low" and "Confidence-Belonging" cohesion groups also correspond to higher representation of population groups other than individuals identifying as White in these classes, with a similar pattern for Discrimination A and the overrepresentation of LGBTQ2+ individuals in the "Low" cohesion group.

Overall, LCM with three classes offers an intuitive way of understanding social cohesion in Canada. Moreover, it paints a picture that relates concepts of cohesion from the factor analysis to demographic groups in Canada, thereby illustrating how various cohesion concepts align along socio-demographic lines.

7. Concluding remarks and discussion

Social cohesion is a multi-dimensional concept referring to social connectedness and solidarity amongst individuals, their communities, and their representative institutions. Measuring social cohesion ensures Canadians are well-informed on trends regarding their interactions with fellow Canadians and organizations, or conversely their relative sense of societal detachment. Better understanding the constituent parts that contribute to or detract from social cohesion, as well as those identifying groups of Canadians lagging in their perceptions of connectedness to Canadian society, sheds light on social priorities moving forward.

Building on prior work using factor analysis and the 2020 GSS [6], nine dimensions of cohesiveness are

identified. Subsequently, employing LCM, the study identifies three groups ("Low", high "Confidence-Belonging" and high "Trust-Participation" cohesion groups) of individuals that share common traits and prioritize certain dimensions of social cohesion. Individual characteristics of each group provide insights into common social sorting mechanisms and the characteristics of those categorized in each group.

This article contributes to the literature on social cohesion as a stepping stone for future work. Two complementary paths forward can be identified: (1) enhancing data collection to capture additional variables and dimensions, and (2) disaggregating the analysis of specific dimensions of social cohesion and their variation over time.

Several limitations pertaining to the data and survey collection methods warrant further consideration. For instance, certain commonly cited social inclusion (e.g., socio-economic (in)equality, poverty) and social mobility [3,5,13,16] dimensions are excluded from this study because the necessary variables are unavailable using the 2020 GSS. Measures of affective distance between individuals would also complement existing measures of trust in so-called "out group" members and a growing literature on polarization (and "social distance") within societies [20,50–53]. Methodologically, low social survey response rates (and potential self-selection biases), survey mode effects (e.g., data collection by telephone versus online surveys impacting responses), survey design and alternative data sources are all priorities in the study and measure of social cohesion.

Future research should seek to delve deeper into the specific dimensions of social cohesion and variation over time. While analyzing overall social cohesion (i.e., as an aggregate) yields interesting results, it can also obscure variation across dimensions of cohesiveness and population groups. Moreover, while this research provides a high-level static portrait of social cohesion within Canada, ongoing research is needed to measure how social cohesion fluctuates over time. Such longitudinal approaches would ensure Canadians remain informed of variations and emerging trends in social cohesion moving forward.

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Supplementary data

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