

Context

- Frequent emergency department (ED) users are a small proportion of ED users (~5% of total users), but they can add up to a disproportionately large number of ED visits (up to 30%) [1]
- Medical and self-perceived health variables have been associated with frequent ED use [2, 3]
- Medical variables are usually summarized as comorbidity indices with different calculation methods (weights, timeframes)
- No study has compared comorbidity indices to self-perceived health variables in the prediction of frequent ED use

Objectives

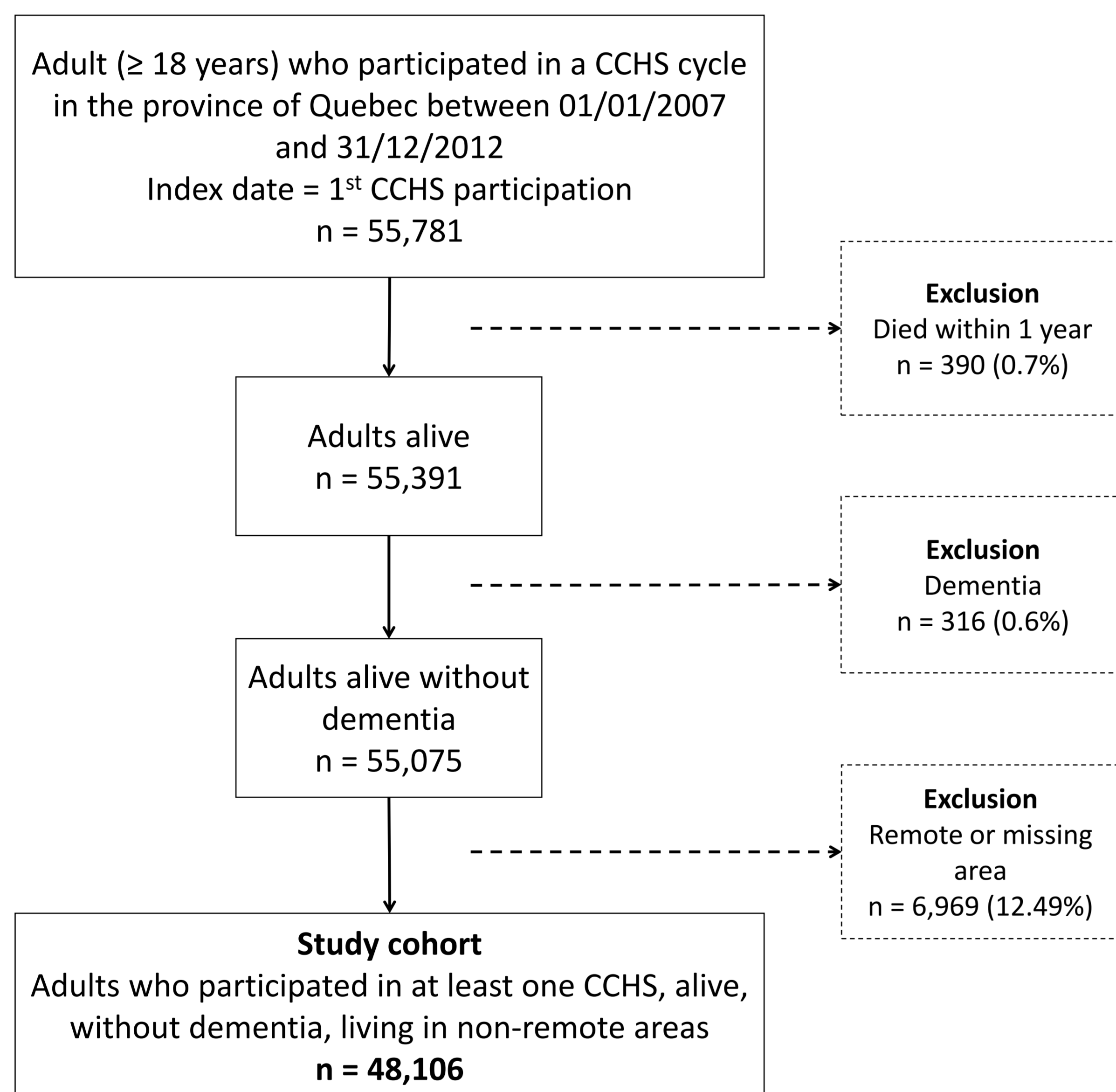
To compare the performances of two predictive models for frequent ED use: one using **comorbidity indices** derived from an administrative database and one using **self-perceived** health, in an adult population from Quebec (Canada)

Methodology

Design and data sources

Observational population-based cohort study (the TorSaDE cohort) using the Canadian Community Health Survey (CCHS, 2007-2012 3 cycles) linked to Quebec's administrative data

Participants



Variables

- Baseline model: Age; Public Prescription Drug Insurance Plan (PPDIP); Type of residential area; Number of previous ED visits (1 year)
- 9 Combined Comorbidity Indexes: Charlson, Schneeweiss, or Van Walraven weight system over 1, 3, or 5 years timeframe [4]
- Self-perceived health (PH): Poor, Fair, Good, Very good, Excellent

Statistical analyses

- Outcome: frequent ED use (≥3 ED visits, binary variable) measured 1 year after the index date
- Multivariable logistic regressions
- Comparison: Net reclassification improvement (NRI), Integrated Discrimination Index (IDI), Nagelkerke R², Akaike information criterion (AIC), Area under the receiver operating characteristic curve (AUC), Brier score, Hosmer-Lemeshow test (HL) [5]

Sensitivity analyses

Analyses have also been conducted on frequent use ≥4 ED visits during 1 year and using continuous versions of the comorbidity indices

Results

- Results are shown for frequent use ≥3 ED visits
- Interpretations for frequent use ≥4 ED visits are similar
- Categorical versions of the comorbidity indices perform better than the continuous ones (not shown) independently of the weight system

Table 1. Cohort characteristics (total, frequent users and non frequent users). *Comorbidity index: Charlson weights over 1 year.

Variables	Total (%) N = 48,106	Frequent users N = 1,763	Non-frequent users N = 46,343
Sex (Baseline)			
F	26,245 (54.56)	996 (56.49)	25,249 (54.48)
M	21,861 (45.44)	767 (43.51)	21,094 (45.52)
Age (Baseline)			
18-34	12,125 (25.20)	409 (23.20)	11,716 (25.28)
35-55	14,562 (30.27)	453 (25.69)	14,109 (30.44)
55-65	9,749 (20.27)	307 (17.41)	9,442 (20.37)
65-74	6,915 (14.37)	270 (15.31)	6,645 (14.34)
75+	4,755 (9.88)	324 (18.38)	4,431 (9.56)
PPDIP status (Baseline)			
Regular	14,872 (30.92)	567 (32.16)	14,305 (30.87)
Age 65	5,164 (10.73)	317 (17.98)	4,847 (10.46)
Private insurance	25,560 (53.13)	694 (39.36)	24,866 (53.66)
Last-resort assistance	2,510 (5.22)	185 (10.49)	2,325 (5.02)
Residential area (Baseline)			
Rural (<10,000 inh.)	9,709 (20.18)	432 (24.50)	9,277 (20.02)
Small town (10,000-100,000 inh.)	9,154 (19.03)	538 (30.52)	8,616 (18.59)
Metropolitan (≥100,000 inh.)	29,243 (60.79)	793 (44.98)	28,450 (61.39)
Number of previous ED visits (Baseline)			
0	37,217 (77.36)	688 (39.02)	36,529 (78.82)
1	6,903 (14.35)	403 (22.86)	6,500 (14.03)
2-3	3,172 (6.59)	420 (23.82)	2,752 (5.94)
4+	814 (1.69)	252 (14.29)	562 (1.21)
Perceived health			
Bad	1,058 (2.20)	134 (7.60)	924 (2.00)
Passable	4,596 (9.56)	365 (20.72)	4,231 (9.14)
Good	15,037 (31.28)	589 (33.43)	14,448 (31.20)
Very good	16,931 (35.22)	467 (26.50)	16,464 (35.55)
Excellent	10,453 (21.74)	207 (11.75)	10,246 (22.12)
Comorbidity index*			
0	43,455 (90.33)	1,336 (75.78)	42,119 (90.89)
1-2	3,186 (6.62)	242 (13.73)	2,944 (6.35)
3+	1,465 (3.05)	185 (10.49)	1,280 (2.76)

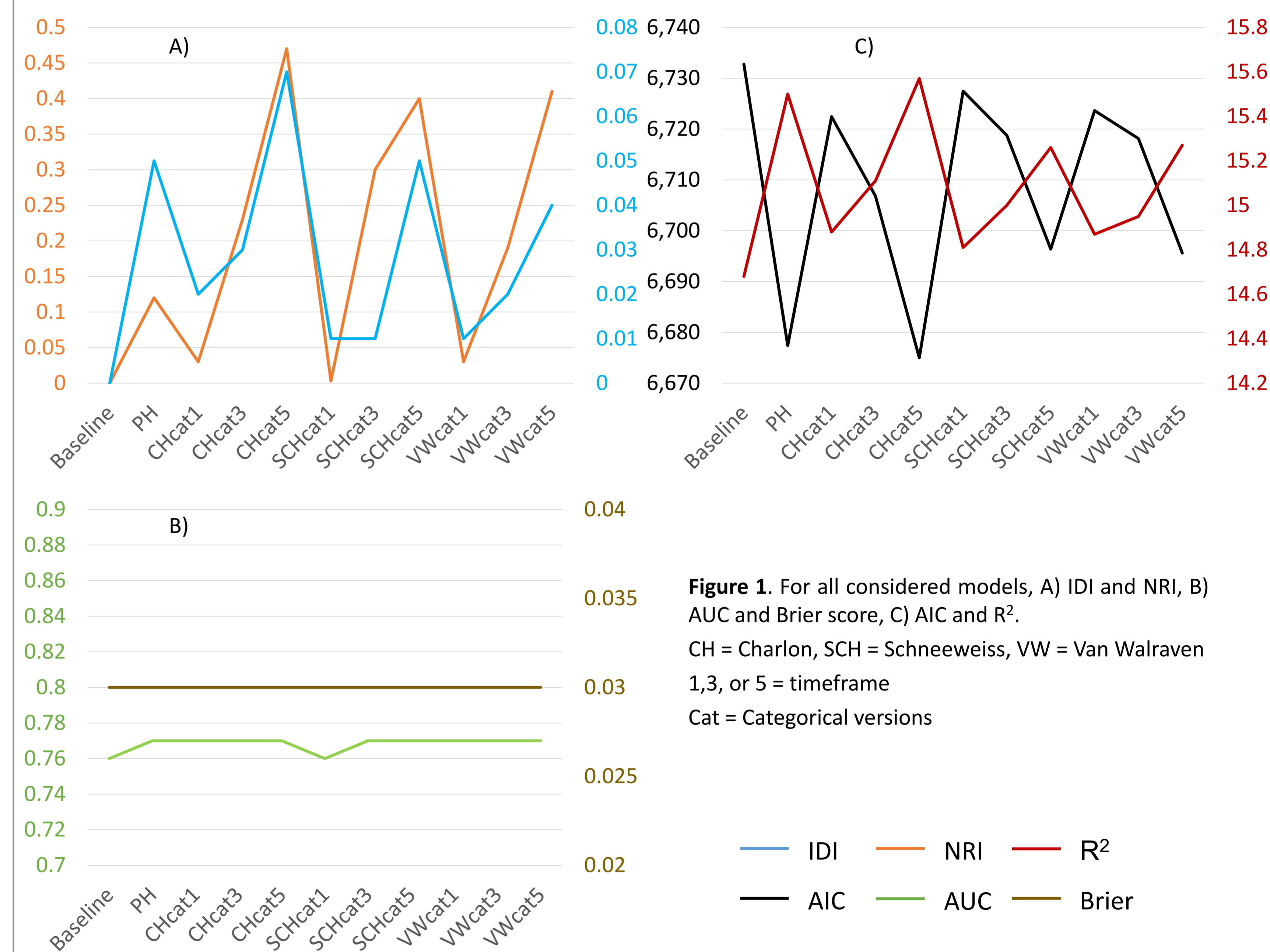


Figure 1. For all considered models, A) IDI and NRI, B) AUC and Brier score, C) AIC and R². CH = Charlson, SCH = Schneeweiss, VW = Van Walraven 1,3, or 5 = timeframe Cat = Categorical versions

Conclusions

- Both models (comorbidity index and self-perceived health) are **comparable** in terms of statistical criteria
- Longer timeframes for comorbidity indices and categorical versions (compared to continuous ones) result in **increased performances**
- Relevant for studies using only self-administered questionnaires or for refining prediction models

References

1. Doupe, Malcolm B., et al. "Frequent users of emergency departments: developing standard definitions and defining prominent risk factors." *Annals of emergency medicine* 60.1 (2012): 24-32.
2. Krieg, Cynthia, et al. "Individual predictors of frequent emergency department use: a scoping review." *BMC health services research* 16.1 (2016): 594.
3. Andrén, Kjerstin Genell, and Urban Rosenqvist. "Heavy users of an emergency department—a two year follow-up study." *Social science & medicine* 25.7 (1987): 825-831.
4. Simard, Marc, Caroline Sirois, and Bernard Candas. "Validation of the combined comorbidity index of Charlson and Elixhauser to predict 30-day mortality across ICD-9 and ICD-10." *Medical care* 56.5 (2018): 441-447.
5. Steyerberg, Ewout W., et al. "Assessing the performance of prediction models: a framework for some traditional and novel measures." *Epidemiology (Cambridge, Mass.)* 21.1 (2010): 128.