

# Application of a case-mix classification based on the functional autonomy of the residents for funding long-term care facilities

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## Abstract

**Introduction:** increasing public costs for the care of the elderly have created fundamental changes that are redefining the basic principles of health care funding. In the past, overall institutional funding was predominantly tied to spending. In view of the limitations of this approach to funding long-term care facilities, case-mix classification tries to take into account the characteristics of the residents as a tool for predicting costs. Recently, a new case-mix classification based on the functional autonomy profile of the residents – ISO-SMAF profile – was developed in the Province of Quebec, Canada. This classification can be used to change the funding system to base it on the functional autonomy characteristics of the residents.

**Objectives:** the main objective of this study was to apply the ISO-SMAF classification to funding long-term care facilities in one area of the Province of Quebec and to compare the results of this new funding methodology to the formal methodology.

**Design:** this study used a cross-sectional design.

**Methodology:** the population under study comprised all residents of all 11 long-term care facilities in the Eastern Townships area of Quebec. Each resident was assessed using the Functional Autonomy Measurement System. The theoretical budget was calculated based on the adjusted cost per year associated with each ISO-SMAF profile derived from a previous economic study.

**Results:** the theoretical budget based on the ISO-SMAF profiles may highlight the under- or over-funding of a facility when compared to the usual funding system based predominantly on the number of beds and hours of care.

**Conclusion:** the results of this study show the feasibility of applying the new funding approach to long-term care facilities. However, implementation of the ISO-SMAF classification for funding must be supported by continued and computerised residents' medical files including the Functional Autonomy Measurement System.

**Keywords:** long-term care, elderly, casemix, classification, functional autonomy, funding, health policy, health economics

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## Introduction

There are real economic, social and political challenges posed by the ageing of the population in Canada and other countries. Between 1980 and 1995, residential and community long-term care expenditures in the Province of Ontario, Canada, increased more than 400% (from \$26 million to

\$2.14 billion) [1] and the other Canadian provinces face the same problem [2]. In 1991, elderly people accounted for 41% of public health care and social services expenses in the Province of Quebec (Canada) although they represented only 11% of the total population [3]. This economic disparity and the costs associated with their care have an impact on health care policy regarding the elderly.

Increasing public costs for the care of the elderly have created fundamental changes that are redefining the basic principles of health care funding. In the past, overall institutional funding was predominantly tied to spending. In this approach, deficit spending was often claimed to be evidence of the need for increased funding. More recently, a common feature of acute health care funding reforms in Canada, the United States and other countries has been the establishment of a more definitive relationship between funding and case-mixes based on diagnosis [4]. In an attempt to extend the principle of case-mix based funding to the long-term health care sector, patient categorisation systems based on disability rather than the diagnosis were developed in the United States [5–11], United Kingdom [11] and Canada [12].

Because of some weaknesses in these existing classifications for long-term care, a new classification was developed in the Province of Quebec, Canada [13]. This classification, the ISO-SMAF profile, is based on the Functional Autonomy Measurement System – *Système de mesure de l'autonomie fonctionnelle (SMAF)* [14]. The classification generates 14 mutually exclusive profiles. The ISO-SMAF profiles are associated with the resources and costs of nursing care. It presents the advantage of being used in an integrated health care network (home, intermediate facilities and long-term care facilities) and containing a number of clinically meaningful categories taking mental functioning and behaviour problems into account.

One interesting aspect of this new classification is its use for funding long-term care facilities. The traditional way used to fund these facilities is based on historical budgets. It is recognised that this method does not take into account changes in the clientele over time. For example, they experienced a continuous increase in disability in the last decade [15–17]. However, the traditional methods of budget allocation to long-term care facilities failed to adjust budgets to the level of care required by the clientele. To overcome this problem, we propose a methodology where the functional autonomy characteristics of the residents are the basis for the budget allocation. In this context, the main objective of this study was to apply the ISO-SMAF profiles to public funding of long-term care facilities in the Eastern Townships, the area surrounding the city of Sherbrooke in the Province of Quebec. The second objective was to compare the results of this new funding methodology with the available budget, i.e. the budget spent in the last year, for these long-term care facilities. From the nature of this study, this is an economic study focusing on the health care sector.

## Methods

The study used a cross-sectional design with a time window from November 2000 to 15 February, 2001.

The Eastern Townships are in the southeast of the Province of Quebec. The 'Régie régionale de la santé et

des services sociaux de l'Estrie' (RRSSS-Estrie) is the regional authority responsible for managing the budget related to health care and social services in this area. RRSSS-Estrie serves a population of 291,359 persons, 13.9% of whom are 65 years of age or older, and 6.3% are 75 or older. To care for the elderly with functional decline, there is a network of facilities on a continuum from homes and collective private homes (with or without public services), to intermediate (1 place for 100 older persons) and long-term care facilities (4 places for 100 older persons). From these, only intermediate and long-term care facilities receive public funds for lodging and caring for their residents. Intermediate facilities ( $n=16$ ; 208 residents) receive a per diem per resident. Long-term care facilities ( $n=11$ ; 1,590 residents) receive annual funding for administrative services, support and operational services and care of the residents. It should be noted that in Quebec long-term care facilities are not used for convalescence and active rehabilitation. In this study, only funding of public long-term care facilities is considered. All residents of these 11 facilities constituted the population under study.

## Functional autonomy measurement system

The SMAF [14] is a 29-item scale developed according to the WHO classification of disabilities [18]. It measures functional ability in five areas: ADL (7 items), mobility (6 items), communication (3 items), mental functions (5 items) and IADL (8 items). Each item is scored on a 5-point scale from 0 (independent) and 0.5 (with difficulties) to 3 (dependent) for a maximum total score of 87. An increase in the score represents a decrease in functional ability. Its reliability and validity have been tested in several studies [19–21]. For this study, four experienced nurses were trained in the use of the SMAF. Formal lectures, case studies and informal discussions were conducted with the aim of assuring uniformity in the use of the SMAF. A follow-up was done in the first week of data collection to answer questions and confirm uniformity across examiners. As a particularity of this study, the data were collected from the caring nurse of the resident.

## The ISO-SMAF classification

The ISO-SMAF classification was developed in a previous study [13]. The study led to the identification of 14 profiles based on the results on the 5 dimensions of the SMAF scale: ADL, mobility, communication functions, mental functions, and IADL. While the results are synthesised in accordance with the 5 dimensions of the SMAF to facilitate presentation, the information is available for the 29 items of the SMAF. These ISO-SMAF profiles can be grouped into four broad categories: IADL disabilities only (profiles 1, 2 and 3), mobility problems predominant (profiles 4, 6 and 9), mental problems predominant (profiles 5, 7, 8 and 10),

severe and mixed disabilities (profiles 11, 12, 13 and 14). These ISO-SMAF profiles are associated with a specific amount of nursing and support services. They are also associated with costs of services according to the type of dwelling.

**Data collection procedure**

Because no data were collected directly from the residents, no consent form was required, but agreements were made with the facilities prior to beginning the study.

The first step in the data collection was to obtain a list of all residents in each of the 11 facilities from the facilities' admissions registers. The second step was to assess the functional autonomy of each resident using the SMAF. The four examiners were assigned to the facilities or units by convenience. Larger facilities were visited by all four research assistants and small facilities by one or two research assistants depending on the number of residents. Before the examiner visited the facility, an agreement was made with the chief nurse of the units to plan the clinician nurse's meeting for the interview with the research assistant. At the time scheduled, an interview was conducted to document the score of each resident on the 29 items of the SMAF.

This data collection procedure determined the functional autonomy of each resident, which was subsequently transformed into the ISO-SMAF profile.

**Funding long-term care facilities based on the ISO-SMAF profile of the residents**

*Theoretical budget*

The theoretical budget of a long-term care facility is the amount of dollars required to care for the residents based on the functional autonomy profile. This budget covers the costs associated with care and operating the facility. The cost estimation used to establish the theoretical budget was taken from a previous study [22], the objective of which was to determine the level of disabilities and the resources involved in caring for elderly people living at home or in institutional settings and in different areas (metropolitan, urban and rural) and to estimate the costs (public, private, voluntary) of these resources. Using the same sample, subjects were classified by ISO-SMAF profile and then the median costs per day associated with each ISO-SMAF profile were calculated for each type of setting [13]. In the context of the present study on annual funding of public long-term care facilities in the Eastern Townships, only the public costs of public long-term care facilities in urban areas were considered. Three categories of costs were considered: care, support, and administrative services. The costs of care include nursing care, skilled and unskilled (personal) care, supervision, transportation for medical purposes and materials (e.g., diapers). The costs

of support services include the costs of cooking, house-keeping, laundry, electricity, heating, repairs, security and taxes. Administrative services cover the management cost of the institution. In this study, infrastructure costs were excluded and the costs of medical care, specialised nursing care, rehabilitation and medication were not taken into account. Table 1 shows the costs per ISO-SMAF profile for public nursing homes.

Based on the costs per year for each ISO-SMAF profile and the profile of each resident in the facility, it was possible to determine the theoretical annual costs for each long-term care facility using the following equation:

$$\text{Annual cost Facility A} = \sum_{14}^1 [\text{no. residents of profile X} \times \$ \text{ per year of profile X}]$$

*Available budget*

The available budget is the amount of dollars per year the facility received for operating the building and caring for the residents in the last year. This budget relies on historical funding based on the number of beds. The source is the annual financial report. The available budget for support and administrative services is based on the number of beds. The cost of nursing care is calculated by adding the resources required to care for the resident using the 'Classification par types en milieux de soins prolongés' (CTMSP) [23]. For the purpose of the comparison with the theoretical budget, the same inclusions and exclusions were considered in the costs.

**Table 1.** Costs per ISO-SMAF profile for public nursing homes

Functional autonomy profile	Public costs per day excluding infrastructure (in 2001\$) <sup>a</sup>	Annual costs in 2001\$ (2001\$ per day × 365 days)
No. 1	— <sup>b</sup>	—
No. 2	61.10	22,300
No. 3	68.48	24,994
No. 4	100.74	36,771
No. 5	78.42	28,624
No. 6	91.89	33,541
No. 7	98.78	36,053
No. 8	114.96	41,962
No. 9	147.76	53,933
No. 10	129.70	47,342
No. 11	159.02	58,043
No. 12	144.81	52,856
No. 13	169.63	61,914
No. 14	183.19	66,863

<sup>a</sup>Conversion of 1995\$ from Hébert et al. (2001) into 2001\$ = 1995\$ × 10.5% (cumulative inflation rate 1995–2001).

<sup>b</sup>No resident with profile no. 1 was found in these long-term care facilities.

## Results

### Description of the population

The census of the residents of the 11 long-term care facilities showed that 1,590 were institutionalised at the time of the study (Table 2). The size of the public facilities varied considerably from 48 to 386 residents, reflecting the geographical area (urban/rural) and the specialisation of some facilities.

The distribution of the ISO-SMAF profiles across the long-term care facilities are presented in Table 3. Two major points emerged from these results. First, as expected because of the vocation of the long-term care facilities, 67.7% of the residents across the facilities showed a high level of disability (profiles 11 to 14). This is not surprising because long-term care facilities are the end point of a continuum of services for elderly with functional decline. The exception is the G rural facility where the percentage is much lower (23.3%). In fact, this facility is known to specialise in mental problems. This is reflected in the large proportion (68.3%) of residents with profiles 5, 7, 8 and 10 (mental problems predominant). Secondly, the results show that some residents in these facilities present a low level of disability (profiles 1, 2, 4 and 6). In view of the higher costs to take care of them in LTC facilities compared to intermediate facilities, this leads to questions regarding the justification of the admission of these residents to a long-term care facility.

### Theoretical budget and available budget

The theoretical and the available budgets are presented in Table 4. The result shows a shortage in the available budget to care for the residents based on their functional autonomy profiles for all facilities. The shortages vary from 2–33% and represent overall \$22 million for the whole area.

**Table 2.** Results of the census by facility and mean age of the residents

Long-term care facility	Number of residents	Age Mean (standard deviation)
A rural	96	82.1 (11.2)
B rural	89	84.3 (10.1)
C rural	116	81.5 (13.0)
D rural	100	82.2 (10.7)
E rural	135	83.4 (10.1)
F rural	130	84.4 (9.2)
G rural	60	57.1 (16.6)
H urban	51	76.6 (13.7)
I urban	48	81.0 (8.1)
J urban	379	83.9 (9.7)
K urban	386	75.5 (16.0)
Total	1,590	80.2 (13.5)

## Discussion

The main objective of this study was to apply the ISO-SMAF classification to funding long-term care facilities. The second objective was to compare the results of this new funding methodology with the formal methods in use in the Province of Quebec. The results show that funding the facilities based on the severity of the disabilities of their residents in regard to functional autonomy highlights the under-funding of a facility when compared to the usual funding methodology based on the number of beds and hours of care.

Can we trust these results? Some points related to the internal validity of this study must be discussed. First, there is no possibility of selection bias since we used the total population of the facilities, excluding de facto the possibility of selecting subcategories of residents presenting more or less disabilities. Second, four trained examiners performed all evaluations. This decreases the possibility that the institutions attempted to manipulate the assessment for financial reasons. Third, the validity of the cost estimation by profiles used in the theoretical budget has been demonstrated in a previous study. Moreover, to counteract the different timing of cost estimations between the original study and the present study, the costs estimations used in this study were expressed in 2001 dollars. Overall, we can be confident of the good internal validity of our study.

Since internal validity seems to be established, we turn to the main results of this study: long-term care facilities seem to be under-funded if we base funding on the functional autonomy profiles of their residents. Is this in fact the case? First, one important point needs to be highlighted: there has been a shift in the clientele towards poorer functional autonomy leading to an increased level of disability in the elderly [15–17]. At the same time as elderly disability increased, the health system to care for them faced major economic constraints. In the past five years, cost cutting has occurred across the Quebec health care system. These two conflicting situations increase the gap between funding and service delivery. This situation is evident from the traditional method of budget allocation to long-term care facilities. In fact, our results confirm the gap between the budget and needs of the long-term care facilities to care for their clients. Does this mean that care is not delivered to the residents? Probably not. However, it is well known that nursing staff have a heavy caseload and signs of burnout are imminent, such as the increasing time for sick leave at most of the facilities. What we do not know exactly is the quality of care. Special attention to this aspect of care delivery should be examined periodically in each facility.

What can we say about external validity? We must remember that the goal of this study was not the generalisation of the results to other areas of the Province of Quebec. Indeed, the goal was to test the feasibility of the method, which can then be applied elsewhere.

**Table 3.** Distribution of the ISO-SMAF profiles for each long-term care facility

	IADL disabilities only			Mobility disabilities predominant					Mental problems predominant					Severe and mixed disabilities				
	Profile 1	Profile 3	Total	Profile 4	Profile 6	Profile 9	Profile 5	Profile 7	Profile 8	Profile 10	Total	Profile 11	Profile 12	Profile 13	Profile 14	Total		
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)		
A rural N	0		22	1	4	17	5	2	3	1	11	7	10	21	25	63		
(%)			(22.9)	(1.0)	(4.2)	(17.7)	(5.2)	(2.1)	(3.1)	(1.0)	(11.4)	(7.3)	(10.4)	(21.9)	(26.0)	(65.6)		
B rural N	0		10	1	3	6	1	1	2	4	8	8	16	22	25	71		
(%)			(11.2)	(1.1)	(3.4)	(6.7)	(1.1)	(1.1)	(2.2)	(4.5)	(8.9)	(9.0)	(18.0)	(24.7)	(28.1)	(79.8)		
C rural N	0		20	2	18	18	3	3	1	7	14	11	9	28	34	82		
(%)			(17.2)	(1.7)	(15.5)	(15.5)	(2.6)	(2.6)	(0.9)	(6.0)	(12.1)	(9.5)	(7.8)	(24.1)	(29.3)	(70.7)		
D rural N	1		19	7	12	12	2	2	4	2	8	5	13	26	28	72		
(%)	(1)	(1)	(19)	(7)	(12)	(12)	(2)	(2)	(4)	(2)	(8)	(5)	(13)	(26)	(28)	(72)		
E rural N	0		26	1	8	17	2	6	5	8	21	9	18	28	33	88		
(%)			(19.2)	(0.7)	(5.9)	(12.6)	(1.5)	(4.4)	(3.7)	(5.9)	(15.5)	(6.7)	(13.3)	(20.7)	(24.4)	(65.1)		
F rural N	1		26	3	23	23	3	3	3	5	11	11	6	36	39	92		
(%)	(0.8)	(0.8)	(20)	(2.3)	(17.7)	(17.7)		(2.3)	(2.3)	(3.8)	(8.4)	(8.5)	(4.6)	(27.7)	(30)	(70.8)		
G rural N	0		5	2	3	3	9	13	2	17	41	2	4	3	5	14		
(%)			(8.3)	(3.3)	(5.0)	(5.0)	(15.0)	(21.7)	(3.3)	(28.3)	(68.3)	(3.3)	(6.7)	(5.0)	(8.3)	(23.3)		
H urban N	0		5	5	5	5	3	4	4	6	17	7	4	9	9	29		
(%)			(9.8)	(9.8)	(9.8)	(9.8)	(5.9)	(7.8)	(7.8)	(11.8)	(33.3)	(13.7)	(7.8)	(17.6)	(17.6)	(56.7)		
I urban N	0		5	5	5	5	6	6	5	5	11	5	9	6	12	32		
(%)			(10.4)	(10.4)	(10.4)	(10.4)	(12.5)	(12.5)	(7.8)	(10.4)	(22.9)	(10.4)	(18.8)	(12.5)	(25.0)	(66.7)		
J urban N	1		82	4	18	60	4	17	18	29	68	32	35	53	107	227		
(%)	(0.3)	(0.3)	(21.6)	(1.1)	(4.7)	(15.8)	(1.1)	(4.5)	(4.7)	(7.7)	(18)	(8.4)	(9.2)	(14.00)	(28.2)	(59.8)		
K urban N	1		57	1	56	56	1	6	4	10	21	14	31	141	121	307		
(%)	(0.3)	(0.3)	(14.8)	(0.3)	(14.5)	(14.5)	(0.3)	(1.6)	(1.0)	(2.6)	(5.5)	(3.6)	(8.0)	(36.5)	(931.3)	(79.4)		
N/Total	1	4	277	8	47	222	28	63	46	94	231	111	155	373	438	1077		
(%)	(0.1)	(0.3)	(17.5)	(0.5)	(3.0)	(14.0)	(1.8)	(4.0)	(2.9)	(5.9)	(14.6)	(7.0)	(9.7)	(23.5)	(27.5)	(67.7)		

Table 4. Comparison of the theoretical budget and available budget by long-term care facility

	Available budget	Theoretical budget	Shortfall in the available budget	
	\$	(ISO-SMAF) \$	\$	%
A rural ( <i>n</i> =96)	5,548,173	6,726,120	(1,177,947) <sup>a</sup>	17%
B rural ( <i>n</i> =89)	4,428,917	5,373,118	(944,201)	18%
C rural ( <i>n</i> =116)	6,759,347	7,991,441	(1,232,094)	15%
D rural ( <i>n</i> =100)	5,149,136	6,784,084	(1,634,948)	24%
E rural ( <i>n</i> =135)	8,100,285	9,378,250	(1,277,965)	14%
F rural ( <i>n</i> =130)	9,669,835	12,851,823	(3,181,988)	25%
G rural ( <i>n</i> =60)	2,201,419	2,242,907	(41,488)	2%
H urban ( <i>n</i> =51)	2,389,823	2,782,931	(393,108)	14%
I urban ( <i>n</i> =48)	1,937,723	2,662,467	(724,744)	27%
J urban ( <i>n</i> =379)	14,610,327	21,692,976	(7,082,649)	33%
K urban ( <i>n</i> =386)	18,661,178	22,773,450	(4,112,272)	18%
Total	79,456,163	101,259,567	(21,803,404)	22%

<sup>a</sup>Figures in parentheses indicate a negative value.

How can the results of this study be integrated in the planning of new admissions to long-term care facilities? Using the ISO-SMAF profiles, it is possible to establish a picture of the facility in terms of the case-mix of residents. From this picture, administrators, decision-makers or admission regulation boards can compare the disability profile of the residents of a specific facility to the others, or the facility to the area. For example, facility G shows 68% of its clientele presenting mental problems compared to 5.5% in facility K. The implications of this knowledge may be integrated in the planning and administration of the long-term care health organisation.

At the facility level, administrators may plan resources development and allocation based on the specificity of the clientele. For example, facility G, which seems to specialise in mental problems, may choose to optimise this expertise and to manage their staff in accordance with this speciality. Training sessions may be organised to increase the level of competence in all staff sub-categories. The same strategy may be applied in facilities receiving a high proportion of very disabled residents. At a macroscopic level, admission boards may plan the admission of new residents based on the facility's case-mix. Also, infrastructure and equipment resources may be planned more efficiently if the profile of the facilities in the area is known.

What is the main limitation of this methodology for funding long-term care facilities? In this kind of system where funding is based on the functional autonomy profile, it may be viewed as an incentive to neglect rehabilitation efforts. For example, what is the advantage for a facility to apply a health care plan including rehabilitation regarding an incontinence problem as compared to the use of diapers? Or why should it invest in rehabilitation resources for fall prevention, walking problems or decreased mobility? These interventions may have a positive impact on the functional autonomy of the resident but are a disincentive in respect to budget allocation. Taking into account this 'incentive to do less or nothing', a funding system based on the

functional autonomy profiles of the residents should incorporate a positive incentive to improve the functional autonomy of their residents, such as investing the money saved by improving functional autonomy in rehabilitation services.

Another potential problem is that the facility may be over- or under-funded for the fiscal period if the picture of the residents in the facility does not accurately represent the facility over the entire period to which the 'snapshot' is applied. There is an average 30% turnover of residents per year in the Eastern Townships, which could result in a false picture of the facility. A continuous computerised monitoring system may overcome this problem.

Is a funding system based on the functional autonomy profile feasible on a large scale? Some preconditions may be required before this funding system is introduced. First, the use of the SMAF must be integrated in all health care plans for the elderly. For example, the Province of Quebec just adopted legislation proposing a common tool for evaluating the elderly including the SMAF. Second, as opposed to this study where a census of the long-term care facilities provided the functional autonomy profiles of their residents, implementation of this funding system should be based on a continued and computerised resident medical file including the SMAF. With this continuous information tool, the snapshot can be taken at any time, such as at the end of the fiscal year, and the budget allocated accordingly.

## Conclusion

The results of this study show the feasibility of the new funding approach to long-term care facilities. The theoretical budget based on the functional autonomy profile, defined as the amount of dollars required to meet the needs of the clientele, may highlight the under- or over-funding of the facility when compared to the usual funding system based predominantly on the number of beds and hours of care. However, caution should be exercised in regard to the 'bad use' of this system, where

an incentive to do less to improve functional autonomy may be introduced. Finally, implementation of a funding system like the ISO-SMAF classification must be supported by continued and computerised residents' medical files including the SMAF.

### Key points

- Traditional methods of budget allocation to long-term care are not based on the functional autonomy characteristics of the residents. We propose a methodology to address this shortcoming: the ISO-SMAF profiles.
- ISO-SMAF profiles are based on the Functional Autonomy Measurement System – Système de mesure de l'autonomie fonctionnelle (SMAF). The classification generates 14 mutually exclusive profiles.
- The results showed that funding facilities according to the severity of the residents' disabilities in terms of their functional autonomy highlights the underfunding when applying the usual funding methodology based on the number of beds and hours of care.

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