

Analysis of a territorial approach to the delivery of nursing home care services based on historical data

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Abstract

We analyze a territorial approach to deliver nursing home care services to a territory public health. We present the case of the CSSS assigned to Côte-des-Neiges, Métro center and Parc Extension, specifically the case of the Côte-des-Neiges site (CLSC CDN), where a territorial approach is used since 1980. We first give an historical comparison of patient visits delivered in 1998-1999 and in 2002-2003. We follow with an in-depth analysis of the home services delivered in 2002-2003 to determine whether or not the territorial approach can well support the changing needs of the population. We conclude that the territorial approach to deliver home care nursing services does not sufficiently support fluctuations in population needs for services. Not only is it difficult to predict these fluctuations, but it is difficult to accurately quantify the true needs for services since the availability of nursing services tend to determine the services actually delivered. In sectors of the territory where resources are more scarce (based on previous population needs analyses) or demand for services is greater, the result is work overload for the nursing staff. In addition, this results in service delivery inequities across the entire territory. Therefore, a more dynamic assignment of clients to the nurses based on each nurse's work load and case load rather than based on the geographic location of clients is worth the extra administrative time in case assignment to

ensure a more equitable case load attribution between nurses as well as less inequities between clients in terms of service delivery considering their needs.

Keywords: Nursing home care services, territorial approach.

1 The territorial approach

In Canada, as in many Western countries, home care services is taking a greater place in the health care system. Health Canada reports that total public funding for home care has increased substantially over the last seven years (from \$1.028 billion in 1990-91 to \$2.096 billion in 1997-98), an average annual rate of increase of almost 11% [2]. This is due in part to the ageing of the population, but also to the need to reduce or at least contain health expenditures. It is difficult to estimate the homecare expenses since they are not computed separately. In 1998, Canadian provinces have allocated 2 to 6% of their yearly health care budget to homecare services, or 34\$ to 124\$ per capita [2]. In the United States, annual expenditures for home health care are projected to be \$41.3 billion in 2001 [4] or about 145\$ per capita.

In the province of Quebec, homecare services fall under the responsibility of local community health centres (or CLSC for Centre Local de Services Communautaires) now merged into CSSS (for Centre de Santé et de Services Sociaux) since 2005. In 2003, there were 398 CLSC's in the province of Quebec [3]. The province has spent \$19,1 billions in 2003-2004 for health care services delivered to the population, about 2639\$ per capita and 8% of its Gross Domestic Product (GDP) (this does not include the health care expenditures made by the private sector not covered by the national health insurance) [3, 1]. CSSSs are responsible for delivering homecare services to the population living in the *territory* assigned to them. In fact, contrary to hospitals which cater to the population beyond a specific territory, CSSS's are responsible for the well-being of the population on a given territory. Homecare services may be required for acute illness, post-hospitalization and post-operation treatment, long-term health conditions and/or chronic conditions, permanent disability, including physical and mental disability, or terminal illness. Homecare services are provided by health care professionals that include nurses, occupational therapists, physiotherapists, nutritionists, homemakers, social workers and physicians.

Funding of Quebec health care institutions have been traditionally based on historical budgets. Over the years, efforts have been made to take demographic data as well as data on resource utilization into account to determine future budgets. Needs based budgeting is however still in its embryonic

stage.

This study originates from a practical case encountered at CLSC CDN in Montreal which caters to 125 000 inhabitants, among which 5200 are regular homecare service users. The territorial approach to manage homecare services has been used since 1980. Given the size of the territory, the management team decided to partition the territory into districts, with each district being assigned to a multidisciplinary team of professionals. This has allowed for increased efficiency in terms of case assignment since the geographic location of the client determines which team will be responsible for the care of that client. Furthermore, this allows for a reduction in transport time and therefore allows for more time for direct patient care.

Since September 2000, the territory has been divided into six districts, after having been divided into four districts from 1993 to 2000 in order to absorb the increase in the number of patients and staff.

As indicated, the use of districts facilitates the dispatching of homecare services. When a request for homecare services is sent to the CLSC from a hospital or a physician's office, or when a request is made by a patient or a family member or a friend, the intake nurse identifies the district associated with the patient's address and forwards the request to the manager of the team responsible for that particular district, after having analysed the nature and urgency of the request for services. The analysis by the intake nurse will yield a decision to assign the case to one professional so that a patient requiring nursing care as a major component of his care plan will be assigned to a nurse. This decision is confirmed by the manager of the multidisciplinary team who receives every new request for homecare services and who may decide to assign the case to a different professional, based on the information on the patient's condition. Of course, the professional responsible for the case will, in most cases, involve other professionals in the care of the patient.

A distinction is made between *case manager nurses* (who typically hold a Bachelor's degree in nursing) and *nurse technicians* (who typically hold a community college degree in nursing). The nurse technician will be assigned the short-term cases or the ones not requiring case management.

For instance, a case requiring short-term and specific nursing care such as a wound dressing or a home based antibiotic-therapy treatment post-operation or post-hospitalization, will typically be assigned to the nurse technician of the team (there is one nurse technician per team).

Conversely, a case requiring the organization of a more complex service plan such as organizing activities of daily living, coordinating visits to and ensuring links with doctors and specialists as well as with the pharmacist,

consulting with and arranging for evaluation by other professionals (occupational therapist, physiotherapist, social worker, dietician, etc.) will be assigned to a case manager nurse. Such cases typically include frail elderly patients with a great loss of autonomy, palliative patients, patients with cancer, patients suffering from degenerative diseases or chronic illnesses and patients with serious mental health problems.

There are about two to four case manager nurses per team. In addition to the nurses (case managers and nurse technicians) who are part of the six multidisciplinary teams and to whom cases get assigned to, there are three to four nurses who make up the surplus team. These nurses are not assigned any cases nor a particular district. They are asked to deliver specific nursing care treatments by the professionals responsible for the case and are not responsible for the global care plan of the client. This team will handle nursing visits that the team nurses are unable to absorb, given the number of visits they have already scheduled for themselves. Furthermore, since the working hours of the surplus team nurses are extended until late in the evening (11 p.m.) as well as on week-ends, these nurses are able to absorb visits that are needed outside regular working hours. For instance, a wound dressing that would be required three times a day, seven days a week, will be taken care of by the homecare department and, even though one nurse will be assigned that particular case, she cannot be required to perform all the nursing visits needed. However, the surplus team nurses will be able to absorb some, if not most, of the visits required.

Another feature of the surplus team is that it can serve as a “buffer” team to absorb temporary increases in demands for nursing services thereby contributing to the reduction in work overload. It should be noted however that despite the fact that the surplus team can serve as a buffer, it is difficult to absorb increases in demands in all situations due to, on the one hand, the difficulty to predict these peaks in demands and, on the other hand because the surplus team is often used to compensate for the shortage of nurses during absences of regular nurses. Whether the absence is planned or not (sick day), it is indeed often difficult to find a nurse to replace the one that is absent.

When an increase in work load is more sustainable, the homecare department may also resort to outside agencies. However, such agencies are usually used for long term replacement of nurses.

Since client assignment to nurses is performed according to territory, i.e., the territorial origin of the demand, and not according to actual nurse work load, partitioning of the territory and assignment of nurses to each district must be carried out carefully in order that the nurses end up with similar

case loads. The partitioning is performed on the basis of historical data on number of patients and number of nursing visits. Since the population make-up changes over time thereby bringing about changes in the demands for services originating in each district, districting exercises must be performed on a regular basis to compensate for the fluctuations in demands over time. But since reorganizing districts requires time and resources not to mention that it can be very disruptive for patients as well as for the nurses because of all the changes involved, such an operation would make sense if the demands for services were to be relatively stable for at least five to ten years. Otherwise, a more dynamic method should be considered to assign clients to nurses. By that, we mean that each case assignment should be based on the actual case load of every nurse at the time of the demand for services. While the previous division of the territory into districts at CSSS CDN lasted 7 years, there is now a sense that this approach can no longer sustain now more rapid changes in population needs. In addition to work load inequities between nurses that such fluctuations tend to create, it has been observed that the availability of nursing services tend to determine the services actually delivered. This in turn leads to inequities on how patients are being serviced depending on their place of residence.

Before switching to an alternative method of assigning new cases, an in-depth analysis and assessment of the territorial approach should be performed. This assessment should also include an assessment of the significance of the perceived inequities or differences between case loads as well as differences between nursing services provided for similar patient needs. This assessment will help to determine whether or not the territorial approach is still suitable for the CLSC CDN.

The present paper meets this objective by providing a description of the districting exercise as well as a quantitative assessment of service fluctuations per district using 2002-2003 and 1998-1999 data, the latter having been used to design the current districts. This is followed by an analysis of the use of the surplus team as well as outside agencies in the different districts for the 2002-2003 period. We conclude with a discussion on the advantages and disadvantages of the territorial approach.

2 Fluctuations between 1998-1999 and 2002-2003

The territory of CLSC CDN is currently divided into six *districts*, each one being constituted by several *basic units* which are the census tracts used by Statistics Canada. The current division into districts results from an

analysis performed in 1998-1999, and summarized in [5]. Five criteria have been used for this districting exercise:

- indivisibility of the basic units: each one has to be assigned to only one district
- respect of borough boundaries: the territory of CLSC CDN intersects three different cities (Mont-Royal, Outremont and CDN/Snowdon), and it is preferred that a district not span two different cities for more efficient work with community agencies, which traditionally cater to a specific borough.
- connectivity: no enclaves are authorized
- mobility : since it is encouraged that the visiting staff uses public transportation, the districts should be designed so that travel by bus is easy. Also, travel should not be constrained by major barriers such as railway lines or motorways.
- work load equilibrium : the total work load (measured by the sum of the time spent for the visits and for traveling) of each district should be roughly the same.

The model used in [5] focused primarily on the three first criteria and tried to reach the two last ones in the best possible way. A picture of the resulting partition into districts is given in Figure 1. In 2000, it was considered as optimal in terms of the satisfaction of the professionals, the team managers and the head managers. In the next sections, we check whether the optimality was still reached in 2002-2003.

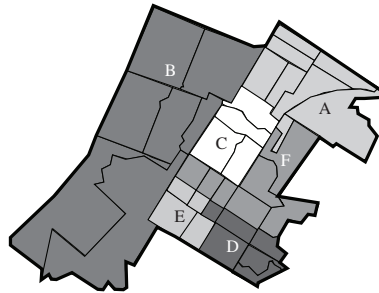


Figure 1: Picture of the different districts constituting the territory of the CLSC Côte-des-Neiges

District	Number of visits		Distribution of the visits (%)		% change
	1998-1999	2002-2003	1998-1999	2002-2003	
A	5014	6892	16	18	+34
B	3739	4655	12	12	+24
C	5652	7832	18	21	+39
D	4538	5285	15	14	+16
E	6206	5333	20	14	-14
F	6059	7555	19	20	+25
Total	31208	37552	100	100	—
Average	5201	6259	—	—	+20

Table 1: Number of visits per district for 1998–1999 and 2002–2003

Comparison between 1998-1999 and 2002-2003

Since complete data are available for the 2002-2003 period, they will be compared with those of 1998-1999 that served for the partition into districts. Such a comparison will help us to determine whether or not the territorial approach supports the changing needs of the population over time.

In Table 1, we compare the total number of visits in the six districts. In 1998-1999 each district had between 12% and 20% of the CLSC’s visits, and the situation is almost the same in 2002–2003 since each district has from 12 to 21% of the visits. However, in 2002–2003 the total number of visits has increased by 20% compared to 1998–1999, and this increase is not the same for each district, as shown in the last column. For example, district E has a decrease in terms of annual number of visits, while districts A and C have seen the largest increase, followed by districts B and F. District D has seen an increase of 16%, but since the average number of visits per district has increased by 20%, it is equivalent to a decrease of relative needs.

We can also observe a big change in the percentage of the demands supported by each district. For example, district E was taking care of about 20% of the population in 1998-1999, and this number has decreased to 14%. There is a smaller decrease of 1% for district D. Conversely, nurses of district C took care of 3% more of the population, and this increase is of 2% for district A and 1% for district F.

In conclusion, this first measure of equilibrium shows that four years are sufficient to create a wide change in the total number of visits and the distribution of these visits among the districts.

When the population needs change, the CLSC has the possibility of modifying the assignment of nurses (of the permanent staff) to districts. As shown in Table 2, the assignment in 2002-2003 is not the same as the one

District	Number of nurses		
	1998-1999	2000-2001	2001- 2005
A	4	5	5
B	3	3.5	4
C	5	4.5	5
D	4	5	3
E	5	4	4
F	5	4	5
Total	26	26	26

Table 2: Evolution of the number and distribution of nurses

recommended by [5] in 1998-1999.

- In the column labelled 1998-1999, we indicate the assignment recommended in [5]. This assignment was never implemented because changes had occurred between the districting exercise and its implementation in September 2000.
- In the column labelled 2000-2001, we indicate the assignment that was valid from September 2000 to June 2001. Notice that one nurse was working half time in B and the other half in C.
- The last column corresponds to the current situation that is valid since June 2001. The nurse that was working half time in B and half time in C has been assigned full time to B. Notice also that Sector D has lost 2 nurses: one was assigned to district C and the other one to district F.

If we compare the 1998-1999 column with the last one of Table 2, we can observe that the number of nurses was decreased by one unit in districts D and E and increased by one unit in districts A and B. This is coherent with Table 1 which indicates a decrease of relative needs in districts D and E, and an increase in districts A and B. We can therefore point out that the CLSC CDN has adapted the assignment of nurses to the changing needs of the population.

In Table 3, we report the average number of visits per nurse. We can observe a big variance between the districts. For example, in 1998-1999, a nurse in district A had to perform an average of 1254 visits while the average number of visits per nurse in the whole territory was 1203. This represents an excess of 4.2%. Districts B, E and F had also more visits than the average, the excess being of 3.6%, 3.2% and 0.7%, respectively. Conversely, districts C and D had 6% and 5.7% less visits than the average. Hence, there was

District	average number of visits per nurse		% difference with the average		% change over time
	1998-1999	2002-2003	1998-1999	2002-2003	
A	1254	1378	+4.2	-5.1	+10
B	1246	1164	+3.6	-19.9	-6.6
C	1130	1566	-6.0	+7.8	+38.6
D	1135	1762	-5.7	+21.3	+55.4
E	1241	1333	+3.2	-8.2	+7.4
F	1212	1511	+0.7	+4.0	+24.7
Average	1203	1452			

Table 3: Evolution of the number of nursing visits per district

a difference of 10.2% between the least and the most busy districts. The situation is totally different in 2002-2003. The most significant differences occur in districts B and D : district B was 3.6% above the average and is now 19.9% below the average; district D was 5.7% below the average and is now 21.3% above the average. The difference between the least and the most busy districts is 41.2% in 2002-2003, which points to a large imbalance.

Another way of studying the change in the distribution of the number of visits is to simply measure the increase or decrease of this number in each district. For example, the number of visits has changed from 1254 to 1378 in district A, which represents an increase of 10%. As shown in Table 3, there was in fact an increase in each district except in district B where the decrease is of 6.6%. The most critical situation seems to be in district D where the number of visits is 3 while the number of visits has increased by more than 50%, followed by district C where the number of visits is kept equal to 5 while there is an increase by about 39% in the number of visits.

When looking at Table 3, one could conclude that districts C, D and F are the most productive ones, followed by A and E. District B seems to be the less productive. However, in order to get a sense of the productivity of a district, one must also take into account the duration of the visits. Each visit has a duration that strongly depends on the type of care. For example, a visit for a blood drawing is more likely to be of a short duration as compared to a visit to a frail elderly patient needing the organization of a more complex service plan. However, in this case, it is also possible for a nurse to visit that particular patient more often and for short visits when the service plan has been implemented and the situation stabilized.

To conclude this section, we can observe that the CLSC CDN has modified the staff assignment (without changing the district zoning) in order to

adapt to the changes in the population needs. But this reassignment appears to be imperfect since districts A, B and E seem to be less productive than the others. We can however not state that the other districts (C, D and F) are the most productive since the larger number of visits may be the result of shorter visits and less complex cases. A more in-depth analysis of the 2002-2003 situation is carried out in the next section.

3 An in-depth analysis of the 2002-2003 period

To better understand inequities during the 2002-2003 period, we include three important factors in our analysis.

- A first visit to a patient is usually longer than subsequent ones, the reason being that data collection and elaboration of the care plan are done during the first visit to the patient. A district with many new cases can therefore appear as less productive than the other districts.
- During the absence of permanent CLSC staff due to illness, disabilities, maternity leaves, training, etc, nurses from *outside agencies* are called for replacement.
- The *surplus team* is called for the visits that need to be performed during regular hours (that the regular staff is unable to absorb due to work overload), evening and weekend hours. Also, some patients need to receive more than one visit per day, and these supplementary visits are handled by the surplus team.

3.1 New patients

In Table 4, we show the number of different patients per month receiving care in each district. In the last two columns, we give the total number of different patients seen during the whole period as well as the average number ρ of different patients per month visited by a nurse. This value is obtained by dividing the total number of different patients in a year by 12 (for an average per month), and by the number of nurses. For example, a nurse in district A will care for an average of 11.87 different patients per month, this number being the result of the division of 712 by 60.

Districts B, E and F have the lowest average ratio of different patients per nurse per month while D has the highest average ratio.

On the basis of detailed data for the seven last months of the 2002-2003 period, we have been able to count the number of new patients per

District	Apr.	May	June	July	Aug.	Sep.	Oct.
A	245	230	202	206	213	207	212
B	158	144	122	133	130	100	125
C	228	230	213	219	220	210	208
D	171	161	162	152	157	142	165
E	192	184	148	184	154	135	152
F	228	215	177	202	193	185	189

District	Nov.	Dec.	Jan.	Feb.	Mar.	Total	ρ
A	254	222	189	200	206	712	11.87
B	168	181	135	123	155	477	9.94
C	259	199	227	210	209	732	12.20
D	159	146	150	120	142	550	15.28
E	141	125	129	178	114	508	10.58
F	238	185	224	241	250	647	10.78

Table 4: Number of different patients per month, per district, and per nurse

Dist.	Sept	Oct	Nov	Dec	Jan	Feb	March	Average	Average by nurse
A	49	51	67	47	30	45	48	48	9.6
B	28	37	57	39	43	36	28	38	9.5
C	49	47	62	47	43	42	49	48	9.6
D	35	49	49	34	25	39	40	39	13
E	27	41	40	27	27	33	19	31	7.75
F	38	51	75	44	40	45	33	47	9.4

Table 5: Number of new clients received by each district in the September 2002 – March 2003 period

month in each district. These numbers are reported in Table 5. We can observe a peak in November. The column labelled "Average" indicates the average number of new clients per month in each district. We can observe big differences since, for example, there are in average 31 new patients per month in district E, while this number is equal to 48 in districts A and C. The last column indicates the average number of new patients per month and per nurse. This average is the highest in district D, and the lowest in district E.

Putting together Tables 3, 4 and 5, we can produce the three following "productivity" rankings of the districts. It is interesting to note that these rankings are similar (all rankings are shown from the lowest to the largest

District	Total number of visits	by nurses from the regular staff	by nurses from outside agencies	% by nurses from outside agencies
A	6892	5608	1284	19
B	4655	2587	2068	44
C	7832	6005	1827	23
D	5285	4476	809	15
E	5333	3761	1572	20
F	7555	5779	1776	23
Total	37552	28216	9336	
Average				25

Table 6: Distribution of 2002–2003 visits

value):

- ranking according to the average number of visits per nurse (see Table 3): B, E, A, F, C, D
- ranking according to the average number ρ of different patients per nurse and per month (see Table 4): B, E, F, A, C, D
- ranking according to the average number of new patients per month and per nurse (see Table 5): E, F, B, A, C, D

Districts C and D are the two most productive ones according to the three rankings, while district E is always among the two less productive. This is perhaps due to a lower number of different patients. District B appears as not very productive according to the first two rankings, but this can be due to a larger number of new patients, as shown by the third position of district B in the third ranking, lower number of different patients and possibly the instability of the replacement (absenteeism observed in B). This confirms the need to analyse the load of each nurse in more details.

3.2 Outside agencies

In Table 6, we show how the total number of visits in each district (which can be read in Table 1) is distributed among nurses from the regular staff and those from outside agencies.

On average, nurses from agencies deliver 25% of the visits. District B made the largest use of this outside help (44%), while district D has the highest percentage of visits performed by the permanent staff (85%). This is consistent with Table 3, since we have observed that district B has the lowest number of visits per nurse while this number is the highest in district

D. Districts A and E look similar in both tables, and the same observation holds for districts C and F. It has been observed that during long-term absences of nurses, the total number of visits over a long period of time carried out by outside agencies is consistently lower. This is explained by several factors:

- it is not possible to find replacement for every day of absence and therefore non-urgent visits are cancelled when replacement is not found;
- it takes more time for an agency nurse at the beginning of the replacement to get acquainted with the patients and therefore she will not be able to visit as many patients as the regular nurse;
- furthermore, the stability of the replacement (one agency nurse versus several agency nurses for short periods of time each time) will also affect the total number of visits.

Therefore, one can conclude that problems with absenteeism and possibly replacement in district B may explain the low number of visits.

With the help of detailed data for the seven last months of the 2002-2003 period, we have been able to split the nurses into three categories:

- nurses from outside agencies,
- nurses from the regular staff with a Bachelor degree, called *case manager nurses*,
- nurses from the regular staff with a community college degree, called *nurse technicians*.

We have computed the number n of visits performed in average by each type of nurse in each district, as well as the average duration τ of a visit. These numbers are reported in Table 7. We can observe that *case manager nurses* usually do 4 to 5 visits per day while this number can go up to 7 for the *nurse technicians*.

We observe from Table 7 that the ranking of the districts according to the number of visits per day (from the lowest to the largest number) for case manager nurses is B, F, E, D, C, A, while this ranking is C, B, F, E, D, A for nurse technicians. Hence, district A seems to be the most productive district, and B appears to belong to the set of not very productive districts. However, the average duration of a visit is the longest in district B. This can be explained by the fact that district B is more extended than the others which implies longer travel times for the nurses. District A has many visits

District	Nurses from agencies		Regular staff			
			case manager nurses		nurse technicians	
	n	τ	n	τ	n	τ
A	11.02	0.48	4.82	0.54	6.52	0.41
B	7.91	0.52	3.61	0.67	4.78	0.54
C	11.02	0.51	4.71	0.54	4.7	0.48
D	7.68	0.69	4.68	0.52	6.09	0.37
E	10.59	0.50	4.17	0.59	5.23	0.58
F	9.62	0.47	4.01	0.64	5.07	0.52

Table 7: Average number n of visits per day and average visit duration τ

District	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Total	Average
A	118	115	137	126	99	105	161	861	123
B	118	164	125	90	112	68	179	856	122
C	197	159	224	178	154	105	157	1174	168
D	119	50	103	71	60	47	23	473	67
E	67	54	77	72	51	77	90	488	70
F	205	203	246	190	169	170	138	1321	189
Total	824	745	912	727	645	572	748	5173	—

Table 8: Distribution of the visits delivered by the surplus team during the September 2002 – March 2003 period

for blood drawing. Since such visits are of short duration, this can explain the large number of visits per day and the small average visit duration.

As already mentioned, a first contact with a new client lasts longer than a regular visit. Notice however that a long average visit duration is not only due to a larger number of new patients. Indeed, for example, we observe from Table 7 that the regular staff in district E has relatively long average visit durations while this district has the smallest average number of new clients per nurse (see Table 5).

3.3 Surplus team

We report in Table 8 the number of visits made by the surplus team during the seven last months of the 2002-2003 period. We can clearly observe large disparities among the districts. An important use of the surplus team in a district is either a sign that the nurses are overloaded in this district or that many patients need more than one visit. Districts C and F make the largest use of the surplus team, followed by A and B, and then by D and E.

To further analyse the use of the surplus team during the seven last

District	Sep.	Oct .	Nov.	Dec.	Jan.	Feb.	Mar.	Total
A	531	553	665	615	453	510	614	3941
B	312	447	488	370	398	314	529	2858
C	655	669	719	622	621	485	564	4335
D	474	427	413	416	372	309	320	2731
E	334	423	422	439	377	391	366	2752
F	634	630	746	555	532	593	521	4211
Total	2940	3149	3453	3017	2753	2602	2914	20828

Table 9: Distribution of the visits delivered to each district during the September 2002 – March 2003 period

months of the 2002-2003 period, we give in Table 9 the total number of visits per month in each district, and we then report in Table 10 the percentage of visits delivered by the surplus team. We can observe large fluctuations in the total number of visits per month, with a peak in November. Conversely, the use of the surplus team does not vary a lot. For example, if we compare October with November in district D, we can see that the total number of visits does not vary a lot (from 427 down to 413) while the percentage of visits delivered by the surplus team increases from 12% to 25%.

The last column of Table 10 shows that in average, the surplus team takes care of 31% of the visits in district F, while this percentage goes down to 17% and 18% in districts D and E respectively. This points to an important imbalance.

As already mentioned, the first contact with a new patient lasts longer than subsequent visits. Hence, a large number of new patients can explain a larger use of the surplus team. However, by comparing Table 5 with Table 10, it clearly appears that the number of new patients is not correlated with the use of the surplus team. For example, by comparing October and December in district E, one can read in Table 5 that the number of new patients has decreased from 41 down to 27, while Table 10 reports an increase of the use of the surplus team from 13% up to 16%.

We finally analyse if the work load fluctuations have an impact on the duration of the visits. For this purpose, we report in Table 11, the total number of visits and their average durations for three different months: September and December 2002 and March 2003. We put in bold the highest visit durations and in italic the lowest ones for each month. We can see that district D has systematically the lowest durations, while districts B, E and F have the highest. It appears that the nurses adjust themselves: the number of clients to visit tends to determine the duration of the visit.

District	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Average
A	22	21	21	20	22	21	26	22
B	38	37	26	24	28	22	34	30
C	30	24	31	29	25	22	28	27
D	25	12	25	17	16	15	7	17
E	20	13	18	16	14	20	25	18
F	32	32	33	34	32	29	26	31
Total	28	24	26	24	23	22	26	25

Table 10: Percentage of the visits delivered by the surplus team during the September2002 – March 2003 period

District	September 2002		December 2002		March 2003	
	n	t	n	t	n	t
A	531	0,50	615	0,50	614	0,50
B	312	0,53	370	0,56	529	0,50
C	655	0,51	622	0,49	564	0,56
D	474	0,48	416	0,49	320	0,44
E	334	0,55	439	0,53	366	0,62
F	634	0,53	555	0,56	521	0,52

Table 11: Number of visits, and average visit durations

4 Conclusion

The territorial approach is with no contest a good way for providing home-care services. The most important advantage of this approach is that case assignment is very straightforward since it is dependent on the geographic location of the client. This in turn shortens the delay between the time the intake nurse receives the request and the actual assignment of the case.

There are however some disadvantages that have to be taken into account since they can create work load inequities between nurses. The first problem is due to the fact that the districting exercise can not forecast the demand in each district. We have observed that the current partition into districts was optimal in 1998-1999, while disparities are apparent between nurses 4 years later. Since the population needs are fluctuating from a district to another, one always has the possibility to reassign nurses to different districts in order to maintain a balance of the work loads. However, even if two such re-assignment have been performed between 1998-1999 and 2002-2003, the difference between the most busy district and the least one has become very large. Another disadvantage of the territorial approach is that

it implies that the nurse assigned to one district need not be concerned with the increased workload for her colleague in another district. This approach does not encourage collaboration between nurses. Furthermore, each nurse will adjust her practice according to her workload. This does not lead to uniformity of practice.

Reorganizing the districts is time consuming, and the CLSCs are therefore not interested in modifying the partition into districts too often. If the partition has to remain stable while the population needs are changing, one could think about using a more dynamic assignment approach where the nurses are not assigned to a fixed district (while the patients are). When a request for homecare services is sent to the CLSC, the intake service would identify the district associated with the address and transfer the demand to the team manager. The manager would then choose a nurse for this new patient, taking into account the workload of each nurse as well as the location of the current patients of each nurse. This however implies the use of an efficient information system. Such a system will increase the availability of information to all nurses, which will in turn lead to more transparency and uniformity in nursing practice. Another possibility that would lie between the current situation and the above proposed one, is to divide the nurses into two groups: the nurses from the first group are assigned to a specific district (like in the current situation), while each nurse of the second group can work on all the territory, or in a fixed subset of districts. This second option is in fact equivalent to increasing the number of nurses in the surplus team. Such solutions imply major changes in the way cases get assigned at the CLSC but can lead to optimised situations in terms of reducing imbalance and inequities.

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