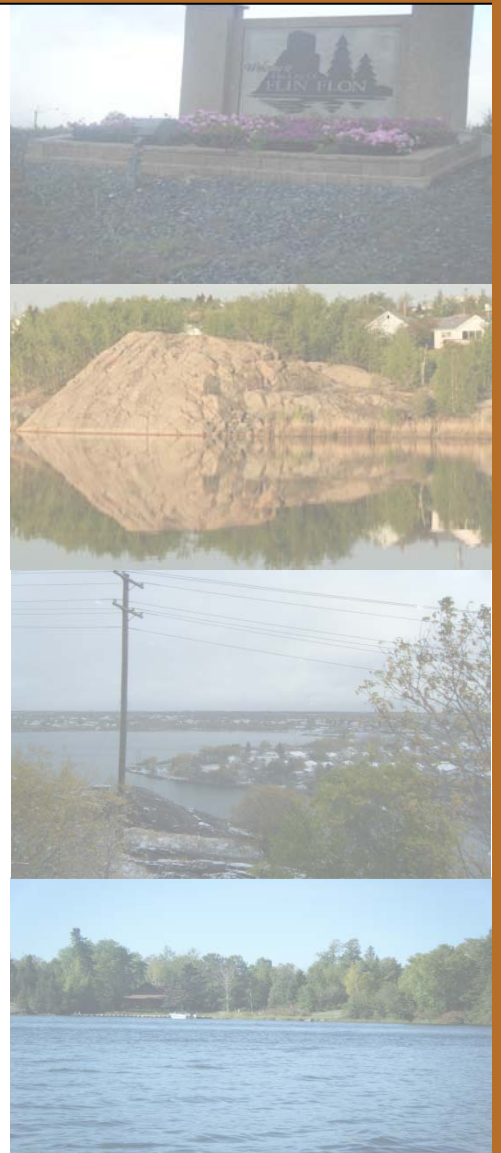


APPENDIX B

POPULATION SAMPLING PROTOCOL



SUMMARY OF SAMPLING STRATEGY

Samples of urine and blood from children living in Flin Flon and Creighton are being collected to determine their average level of exposure to lead, mercury and arsenic and to compare their exposure with other children. The research questions relevant to biological sampling are “What are the current levels of lead in blood, arsenic and inorganic mercury in urine of children in Flin Flon?”, and “What personal factors are associated with the level of measured internal exposure of children in Flin Flon Area (e.g., place of residence, place of work, level of COC in soil, age, gender, diet, personal habits, etc.)?”

The samples that will be collected, the sampling method, the chemical of concern and the age groups being sampled are listed in Table 1.

Table 1: COC, Sample Medium, Collection Method and Age Group

| COC | Medium | Collection Method | Age Groups |
|-------------------|--------|----------------------------|---|
| Lead | Blood | Capillary draw | 0 months to 83 months (under 7) |
| Total Arsenic | Urine | First morning void at home | Continent (approx 30 months) to 179 months (under 15) |
| Inorganic Mercury | Urine | First morning void at home | Continent (approx 30 months) to 179 months (under 15) |

Note: children between approximately 30 months to 83 months will be asked to provide both blood and urine samples.

Approach to sampling

- 1) 200 children in West Flin Flon (or areas with highest soil levels) who are between 0 and 179 months.
- 2) Remainder of sample to selected across other areas of towns to obtain goal of:
 - a. 250 blood samples from children 0 to 83 months old
 - b. 300 urine samples from children 30 to 179 months old¹.
- 3) This approach assumes that there will be approximately 150 children who provide both urine and blood samples (30 months to 83 months).

¹ Rationale for sampling 50 more children for urine is that the standard error of the geometric mean for inorganic mercury in urine is not well established. This provides us with a bit more data.

- 4) This will require 400 unique children participate in the study.

Table 2 has the details of the sampling plan.

Table 2: Number of Children Sampled by Age Group and Area

| Area | Blood Only | Blood and Urine | Urine Only | Total |
|------------------------|-----------------|-----------------|------------------|------------|
| | Under 30 months | 30 to 83 months | 84 to 179 months | |
| West Flin Flon | 50 | 100 | 50 | 200 |
| East Flin Flon | 25 | 25 | 50 | 100 |
| Creighton and Channing | 25 | 25 | 50 | 100 |
| Total | 100 | 150 | 150 | 400 |

Because the proposed sample will be representative of all children living in Flin Flon and Creighton, analysis of the biological sampling data will answer the first research question. For the same reason, analysis of the biological sampling data, the questionnaire data and environmental sampling data will answer the second research question listed above.

SAMPLING OVERVIEW

Ideally, all residents of Flin Flon and Creighton who are under the age of 15 years should be recruited to the study and interviewed to determine behaviours, exposures and health outcomes that may be associated with observed levels of CoCs. However, the cost of data collection and laboratory analysis of these samples for all eligible study participants would be prohibitive. A representative sample of the source population is often used to infer population parameters. A sample chosen at random from the whole population will have, on average, the same characteristics as the source population in which it is sampled. Hence, the results of the survey could be generalized to the general population. In addition, we will also consider various sampling designs to ensure that the sample is sufficiently large to detect exposure levels that are greater than acceptable with a reasonable level of confidence. The following sections describe these aspects in detail.

Selection of Study Area

The city of Flin Flon is located in west-central Manitoba on the border with Saskatchewan. According to the 2006 census, it has a population of approximately 5,590. The neighbouring town of Creighton, located just southwest of Flin Flon, in Saskatchewan, has a population of approximately 1,500. Both Flin Flon and Creighton were established in the 1930's in response to demand for employment at the Hudson Bay Mining and Smelting (HBMS) complex.

According to results from the HHRA, the location of different communities within the Flin Flon-Creighton area relative to the HBMS complex has a significant influence on the potential exposure of its residents. The proximity of the community to the smelter as well as the location relative to predominant wind direction will determine the level of particulate in ambient air and the amount that is available for deposition. In the HHRA, Flin Flon and Creighton was subdivided into 4 sub-communities:

1. East Flin Flon (designated as the area east and northeast of Ross Lake);
2. West Flin Flon (designated as the area west of Ross Lake);
3. Channing; and,
4. Creighton.

Table 3 summarises the average soil concentration of CoCs found in the soil for these 4 communities. The results indicate that the highest levels of lead and mercury were observed in West Flin Flon while elevated levels of arsenic were found in West Flin Flon and Creighton. East Flin Flon and Channing have relatively lower soil concentration of the CoCs.

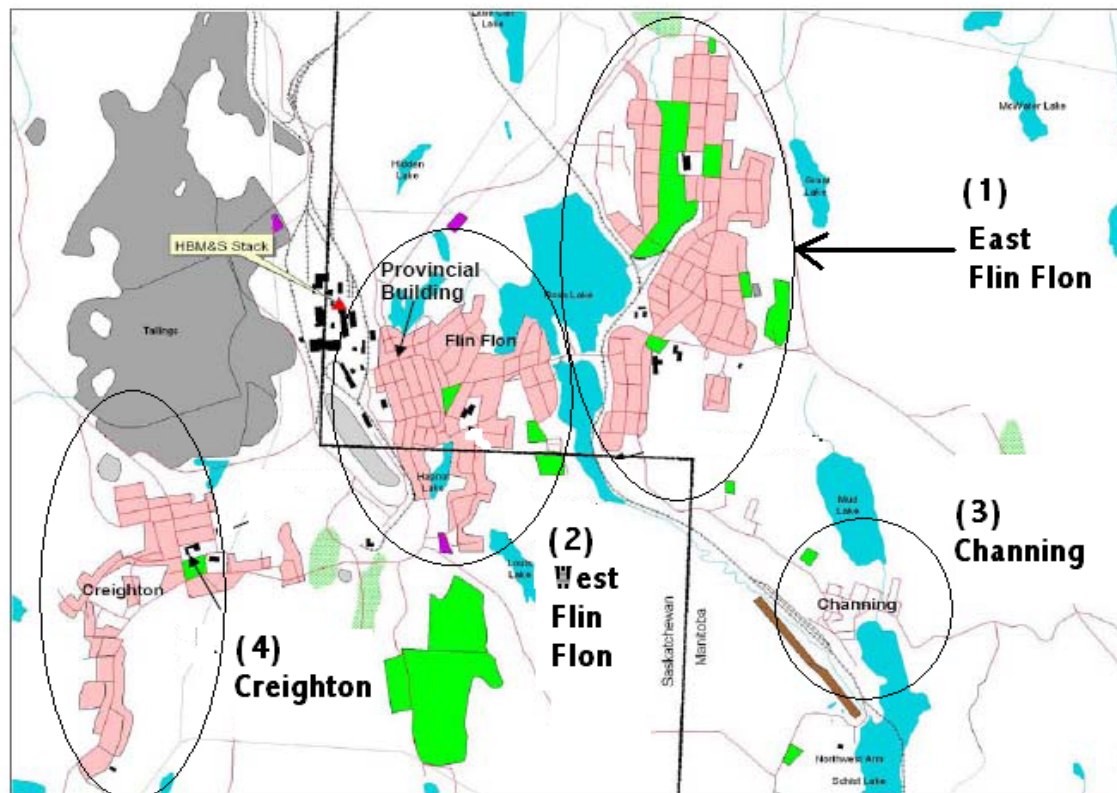
Channing is a relatively small community and, for the analysis, it will probably be combined with another similar sub-community. In this section, we assume that Creighton and Channing will be combined for the analysis.

For the exposure survey, the 3 sub-communities will form the groups to be sampled. Maintaining these strata offers a number of advantages; it allows for direct comparison with HHRA estimates and internal comparison can be conducted with the lowest sub-community used as the referent group. The relative geographical locations of the strata are shown in Figure 1.

Table 3: Soil concentrations of Chemicals of Concern in East and West Flin Flon, Creighton and Channing

| Chemical of Concern | East Flin Flon | West Flin Flon | Creighton | Channing |
|---------------------|----------------|----------------|-----------|----------|
| Arsenic | 16 | 67 | 64 | 17 |
| Lead | 141 | 332 | 164 | 112 |
| Mercury | 6.0 | 106 | 6 | 2.8 |

Figure 1: Relative geographical locations of East Flin Flon, West Flin Flon, Channing, and Creighton.



Selection of Age Groups

The study population consists of residents living in private dwellings in Flin Flon and Creighton census subdivisions who are under the age of 15 years. This age group was selected in order to match with the age groupings used in the HHRA. Consistent age groupings will facilitate comparison of HHRA predicted environmental exposures for this population to lead, arsenic, and mercury to internal exposure measured by biomonitoring and exclude occupational exposures. In addition, these age groupings are similar to those used in other biomonitoring studies such as the Canadian Health Measures Study² and hence will facilitate external comparison. As shown in Table 4, data from the most recent census (2006) indicates approximately 1,040 children under the age of 15 living in Flin Flon and another 315 live in Creighton.

² Wong S. and Lye E. *Lead, mercury and cadmium levels in Canadians*, Statistics Canada, Catalogue no. 82-003-XPE • Health Reports, Vol. 19, no. 4, December 2008.

Table 4 Age and sex distribution of residents of Flin Flon and Creighton aged 14 and under (Census 2006)

| Age Groups (Years) | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|-----------------------|---|------------|------------|--|------------|------------|
| | Total | Male | Female | Total | Male | Female |
| 0 to 4 | 305 | 165 | 140 | 90 | 55 | 35 |
| 5 to 9 | 325 | 165 | 160 | 110 | 55 | 55 |
| 10 to 14 | 410 | 205 | 210 | 115 | 55 | 60 |
| Total | 1,040 | 535 | 510 | 315 | 165 | 150 |

Development of a Sampling Frame

According to Statistics Canada, there are 2,612 households in Flin Flon and 625 households in Creighton. The registries of residential tax properties in Flin Flon and Creighton could be used as sampling frames. Each of these households will be assigned an identification number to be used for random selection.

Sampling Strategy

The primary sampling unit will be the household and sampling will be stratified by the geographical areas used in the HHRA, namely, East Flin Flon, West Flin Flon, and the combined community of Creighton and Channing. Using the sampling frame developed in the previous section, a stratified random sampling approach will be used to recruit study participants. Households will be sampled at random until the required number of children in each age group and geographic area are sampled.

With 0.4 children under the age of 15 per household in Flin Flon and 100% participation rates, 750 households in Flin Flon will need to be contacted to obtain a sample of 300 children. In Creighton, with 0.5 children per household and a 100% participation rate, we will need to contact 200 households to obtain a sample of 100 children. Unless the participation rate is greater than 30%, all the households in Flin Flon and Creighton would be contacted to achieve the required sample size. If the participation rate is less than 30%, we will not achieve the planned sample size.

Sample size

When choosing the sample size, the desired level of accuracy, the cost of processing the samples and variability of the levels are taken into consideration. The precision of the simple random sample (i.e. no stratification) when sampling with no replacement (i.e. the same individual cannot be selected more than once) is measured by its standard error:

$$2 \text{ S.E}_{it} = 2(\ln \text{ GSD}) \sqrt{(1-f/n)}, \text{ with } \text{S.E}_{it} \text{ the standard error on a log scale}$$

or

$$2 \text{ S.E}_{it} = [\ln \text{GSD}]^{2\sqrt{(1-f/n)}} - 1$$

Where:

n= number of samples,
f= proportion of population that is sampled
 σ = standard deviation of the measurement.

In the case of environmental and biological concentrations, the logarithm of the concentration follows a normal distribution so the value of σ will be log of the geometric standard deviation (gsd) for the sample measurements.

Blood Lead Levels

The HHRA used a GSD of 1.6 for blood lead levels. The HHRA has predicted that the Geometric Mean Blood Lead Level in children under 84 months (See table 5-23 in the draft report, “Human Health Risk Assessment of Flin Flon, Manitoba, and Creighton, Saskatchewan, Chapter 5, Results and Discussion”, Intrinsic Environmental) is 4.6 $\mu\text{g/dL}$ in West Flin Flon, 2.6 $\mu\text{g/dL}$ in East Flin Flon, 3.2 $\mu\text{g/dL}$ in Creighton and 2.6 $\mu\text{g/dL}$ in Channing. The critical population for exposure to lead is children in East Flin Flon under the age of 7 years (less than 84 months) with children in the age group under 36 months having the highest blood lead levels. It is estimated that as many as 150 children in the age group less than 84 months could reside in that area of West Flin Flon with the highest exposure to lead and that, in total, 570 children under the age of 84 months live in Flin Flon and Creighton.

For Blood Lead Levels, it is proposed to sample 100% of the children under 84 months in West Flin Flon (approximately 150 children under the age of 84 months) and another 100 children under the age of 84 months in other areas of Flin Flon, Creighton and Channing. Without adjusting for the sampling fraction, the Blood Lead Levels in children under the age of 84 months should be measured with a precision (2 standard errors of the geometric mean) of $1.6^{2/\sqrt{150}} - 1 = 8\%$ in West Flin Flon and a precision of $1.6^{2/\sqrt{50}} - 1 = 14\%$ in East Flin Flon and in Creighton and Channing. The geometric mean blood lead level in children under the age of 83 months in Flin Flon and Creighton should be estimated with a precision of 0.85% (2 standard errors) for a sample of 350 children (See table 5).

Table 5: Sample size for Blood Lead Levels and Precision of Geometric Mean

| Number of children in Sample | Size of Population Being Sampled | Sampling Fraction | Precision of Estimate of Geometric Mean (2 standard errors) |
|------------------------------|----------------------------------|-------------------|---|
| 50 | 570 | 0.09 | 5.41% |
| 100 | 570 | 0.18 | 3.42% |
| 150 | 570 | 0.26 | 2.49% |
| 200 | 570 | 0.35 | 1.89% |
| 250 | 570 | 0.44 | 1.46% |
| 300 | 570 | 0.53 | 1.12% |
| 350 | 570 | 0.61 | 0.85% |
| 400 | 570 | 0.70 | 0.61% |

Inorganic Mercury

The HHRA predicts that Toddlers (ages 7 months to 4 years) in West Flin Flon are likely to have exposures to inorganic mercury above the allowable level and that the average exposures for other children in Flin Flon and Creighton are likely to be at most 68% of the allowable levels. Because of the difficulties of collecting urine samples from incontinent children who are generally under the age of 30 months, toddlers between the age of 30 months and 83 months will be sampled for mercury. We used two US studies^{3,4} to derive the Geometric Standard Deviation of inorganic mercury levels in urine; in one study, the Geometric Standard Deviation was found to be 1.8 and, in the other, 2. To be conservative, we used a value of 2. We estimate that urine samples will be collected from 50 toddlers (ages 30 months to 59 months) in West Flin Flon, the most highly exposed group of children, with a precision of $2^{2/\sqrt{50}} - 1 = 22\%$ (2 standard errors) without taking the sampling fraction into account.

³ Rogers HS, McCullough J, Kieszak S, Caldwell KL, Jones RL, Rubin C. Exposure assessment of young children living in Chicago communities with historic reports of ritualistic use of mercury. *Clin Toxicol (Phila)*. 2007;45(3):240-7.

⁴ Maserejian NN, Trachtenberg FL, Assmann SF, Barregard L. Dental amalgam exposure and urinary mercury levels in children: the New England Children's Amalgam Trial. *Environ Health Perspect*. 2008 Feb;116(2):256-62.

Table 6. Estimated Hazard Quotients for Inorganic Mercury

| Age | East Flin Flon | West Flin Flon | Creighton | Channing | Background |
|---------|----------------|----------------|-----------|----------|------------|
| Infant | 0.26 | 0.60 | 0.27 | 0.25 | 0.23 |
| Toddler | 0.67 | 1.3 | 0.68 | 0.65 | 0.20 |
| Child | 0.55 | 0.65 | 0.55 | 0.55 | 0.14 |
| Teen | 0.50 | 0.55 | 0.50 | 0.49 | 0.08 |
| Adult | 0.48 | 0.53 | 0.48 | 0.48 | 0.06 |

Infant: 0 to 6 months, Toddler: 7 months to 4 years, Child: 5 to 11 years, Teen: 12 to 19 years, Adult: 20 years and older.

Table 7 shows that a sample of 300 children from a population of 785 children would provide an estimate of the geometric mean inorganic mercury level that is within 2.17% of the true mean 19 times out of 20.

Table 7: Sample size and precision of estimate of inorganic mercury levels

| Number of children in Sample | Size of Population Being Sampled | Sampling Fraction | Precision of Estimate of Geometric Mean (2 standard errors) |
|------------------------------|----------------------------------|-------------------|---|
| 50 | 785 | 0.06 | 8.30% |
| 100 | 785 | 0.13 | 5.39% |
| 150 | 785 | 0.19 | 4.06% |
| 200 | 785 | 0.25 | 3.22% |
| 250 | 785 | 0.32 | 2.63% |
| 300 | 785 | 0.38 | 2.17% |
| 350 | 785 | 0.45 | 1.80% |
| 400 | 785 | 0.51 | 1.49% |

Arsenic

The HHRA predicted that the hazard quotients for arsenic intake would be at or above 1.5 for infants and toddlers (children under the age of 5 years – 59 months) in all regions of Flin Flon and Creighton. The distribution of arsenic levels in urine in children in the US indicates that the Geometric Standard Deviation is approximately 1.5. Because it is difficult to collect urine from children before they are continent, we expect to be able to sample arsenic in urine only from children aged 30 months or more.

We expect to collect 50 urine samples from toddlers in West Flin Flon and about 25 urine samples from toddlers in East Flin Flon and Creighton. The precision of the

arsenic levels in urine in toddlers in Flin Flon and Creighton should be $1.5^{2/\sqrt{75}} - 1 = 10\%$ (2 standard errors). The overall geometric mean arsenic level should be estimated with a precision of 1.26% (2 standard errors) in children between the age of 30 months and 15 years.

Table 8 Predicted Hazard Quotients from Exposure to Arsenic Receptor East Flin Flon, West Flin Flon, Creighton and Channing Compared to Typical Background

| Age* | East Flin Flon | West Flin Flon | Creighton | Channing | Background |
|---------|----------------|----------------|-----------|----------|------------|
| Infant | 1.5 | 1.6 | 2.4 | 1.5 | 1.0 |
| Toddler | 1.5 | 1.8 | 2.5 | 1.5 | 0.93 |
| Child | 0.90 | 1.0 | 1.5 | 0.90 | 0.60 |
| Teen | 0.56 | 0.62 | 0.94 | 0.56 | 0.36 |
| Adult | 0.49 | 0.54 | 1.0 | 0.49 | 0.26 |

*Infant: 0 to 6 months, Toddler: 7 months to 4 years, Child: 5 to 11 years, Teen: 12 to 19 years, Adult: 20 years and older.

Table 9. Precision of Estimate of Geometric Mean Arsenic Level

| Number of children in Sample | Size of Population Being Sampled | Sampling Fraction | Precision of Estimate of Geometric Mean (2 standard errors) |
|------------------------------|----------------------------------|-------------------|---|
| 50 | 785 | 0.06 | 4.77% |
| 100 | 785 | 0.13 | 3.12% |
| 150 | 785 | 0.19 | 2.35% |
| 200 | 785 | 0.25 | 1.87% |
| 250 | 785 | 0.32 | 1.53% |
| 300 | 785 | 0.38 | 1.26% |
| 350 | 785 | 0.45 | 1.05% |
| 400 | 785 | 0.51 | 0.87% |

SE: Standard Error

COMMUNITY PROFILES OF FLIN FLON AND CREIGHTON, MANITOBA, CANADA (CENSUS 2006).

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Population in 2006 | 5,594 | | | 1,502 | | |
| Population in 2001 | 6,000 | | | 1,556 | | |
| 2001 to 2006 population change (%) | - 7 | | | - 4 | | |
| Total private dwellings | 2,612 | | | 625 | | |
| Private dwellings occupied by usual residents | 2,361 | | | 586 | | |
| Population density per square kilometre | 403 | | | 104 | | |
| Land area (square km) | 14 | | | 14 | | |
| Total population | 5,590 | 2,785 | 2,815 | 1,500 | 750 | 750 |
| 0 to 4 years | 305 | 165 | 140 | 90 | 55 | 35 |
| 5 to 9 years | 325 | 165 | 160 | 110 | 55 | 60 |
| 10 to 14 years | 410 | 205 | 210 | 115 | 55 | 60 |
| 15 to 19 years | 435 | 215 | 225 | 130 | 75 | 55 |
| 20 to 24 years | 335 | 170 | 165 | 95 | 50 | 45 |
| 25 to 29 years | 300 | 140 | 165 | 90 | 45 | 40 |
| 30 to 34 years | 315 | 160 | 160 | 75 | 30 | 35 |
| 35 to 39 years | 305 | 150 | 160 | 100 | 50 | 50 |
| 40 to 44 years | 450 | 215 | 230 | 120 | 55 | 65 |
| 45 to 49 years | 630 | 335 | 295 | 155 | 85 | 70 |
| 50 to 54 years | 495 | 270 | 225 | 115 | 60 | 60 |
| 55 to 59 years | 325 | 190 | 130 | 95 | 50 | 40 |
| 60 to 64 years | 210 | 110 | 105 | 40 | 25 | 20 |



| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| 65 to 69 years | 180 | 90 | 90 | 40 | 15 | 20 |
| 70 to 74 years | 160 | 70 | 90 | 35 | 15 | 20 |
| 75 to 79 years | 145 | 65 | 80 | 45 | 15 | 30 |
| 80 to 84 years | 140 | 55 | 85 | 40 | 15 | 25 |
| 85 years and over | 135 | 30 | 105 | 15 | 5 | 5 |
| Median age of the population | 41 | 41 | 41 | 38 | 36 | 39 |
| % of the population aged 15 and over | 81 | 81 | 82 | 79 | 78 | 79 |
| Total population 15 years and over | 4,550 | 2,245 | 2,305 | 1,185 | 590 | 595 |
| Not in a common-law relationship | 4,110 | 2,025 | 2,080 | 1,075 | 535 | 540 |
| In a common-law relationship | 445 | 220 | 220 | 110 | 55 | 55 |
| Total population 15 years and over | 4,550 | 2,245 | 2,305 | 1,185 | 590 | 595 |
| Never legally married (single) | 1,450 | 790 | 655 | 365 | 205 | 160 |
| Legally married (and not separated) | 2,260 | 1,130 | 1,130 | 655 | 325 | 330 |
| Separated; but still legally married | 160 | 80 | 80 | 20 | 15 | 10 |
| Divorced | 360 | 180 | 180 | 45 | 25 | 25 |
| Widowed | 325 | 65 | 260 | 95 | 15 | 80 |
| Total private dwellings occupied by usual residents | 2,360 | | | 585 | | |
| Single-detached houses - as a % of total occupied private dwellings | 76 | | | 75 | | |
| Semi-detached houses - as a % of total occupied private dwellings | 0 | | | 10 | | |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Row houses - as a % of total occupied private dwellings | 2 | | | 3 | | |
| Apartments; duplex - as a % of total occupied private dwellings | 4 | | | 2 | | |
| Apartments in buildings with fewer than five storeys - as a % of total occupied private dwellings | 14 | | | 4 | | |
| Apartments in buildings with five or more storeys - as a % of total occupied private dwellings | - | | | - | | |
| Other dwellings - as a % of total occupied private dwellings | 3 | | | 9 | | |
| Number of owned dwellings | 1,685 | | | 455 | | |
| Number of rented dwellings | 675 | | | 130 | | |
| Number of dwellings constructed before 1986 | 2,200 | | | 475 | | |
| Number of dwellings constructed between 1986 and 2006 | 160 | | | 105 | | |
| Dwellings requiring major repair - as a % of total occupied private dwellings | 15 | | | 11 | | |
| Average number of rooms per dwelling | 6 | | | 6 | | |
| Dwellings with more than one person per room - as a % of total occupied private dwellings | - | | | 2 | | |
| Average value of owned dwelling (\$) | 78,409 | | | 84,274 | | |



| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Total number of census families | 1,610 | | | 450 | | |
| Number of married-couple families | 1,110 | | | 325 | | |
| Number of common-law-couple families | 225 | | | 55 | | |
| Number of lone-parent families | 270 | | | 70 | | |
| Number of female lone-parent families | 220 | | | 50 | | |
| Number of male lone-parent families | 55 | | | 20 | | |
| Average number of persons in all census families | 3 | | | 3 | | |
| Average number of persons in married-couple families | 3 | | | 3 | | |
| Average number of persons in common-law-couple families | 3 | | | 3 | | |
| Average number of persons in lone-parent families | 3 | | | 3 | | |
| Average number of persons in female lone-parent families | 3 | | | 3 | | |
| Average number of persons in male lone-parent families | 2 | | | 3 | | |
| Median income in 2005 - All census families (\$) | 69,894 | | | 75,684 | | |
| Median income in 2005 - Married-couple families (\$) | 81,516 | | | 87,364 | | |
| Median income in 2005 - Common-law-couple families (\$) | 55,648 | | | 52,810 | | |
| Median income in 2005 - Lone-parent families (\$) | 25,613 | | | 39,890 | | |



| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Median income in 2005 - Female lone-parent families (\$) | 24,305 | | | 28,351 | | |
| Median income in 2005 - Male lone-parent families (\$) | 26,686 | | | 71,885 | | |
| Median after-tax income in 2005 - All census families (\$) | 56,478 | | | 62,055 | | |
| Median after-tax income in 2005 - Married-couple families (\$) | 66,153 | | | 71,050 | | |
| Median after-tax income in 2005 - Common-law-couple families (\$) | 48,855 | | | 45,642 | | |
| Median after-tax income in 2005 - Lone-parent families (\$) | 24,619 | | | 37,842 | | |
| Median after-tax income in 2005 - Female lone-parent families (\$) | 24,305 | | | 28,095 | | |
| Median after-tax income in 2005 - Male lone-parent families (\$) | 25,662 | | | 58,983 | | |
| Total private households | 2,360 | | | 585 | | |
| Households containing a couple (married or common-law) with children | 640 | | | 195 | | |
| Households containing a couple (married or common-law) without children | 695 | | | 180 | | |
| One-person households | 705 | | | 135 | | |
| Other household types | 320 | | | 75 | | |
| Average household size | 2 | | | 3 | | |
| Median income in 2005 - All private households (\$) | 55,618 | | | 62,179 | | |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Median income in 2005 - Couple households with children (\$) | 92,565 | | | 92,232 | | |
| Median income in 2005 - Couple households without children (\$) | 62,200 | | | 69,169 | | |
| Median income in 2005 - One-person households (\$) | 30,546 | | | 23,578 | | |
| Median income in 2005 - Other household types (\$) | 35,757 | | | 44,680 | | |
| Median after-tax income in 2005 - All private households (\$) | 46,131 | | | 52,470 | | |
| Median after-tax income in 2005 - Couple households with children (\$) | 72,906 | | | 75,080 | | |
| Median after-tax income in 2005 - Couple households without children (\$) | 52,469 | | | 56,917 | | |
| Median after-tax income in 2005 - One-person households (\$) | 27,877 | | | 21,718 | | |
| Median after-tax income in 2005 - Other household types (\$) | 33,759 | | | 40,971 | | |
| Median monthly payments for rented dwellings (\$) | 501 | | | 601 | | |
| Median monthly payments for owner-occupied dwellings (\$) | 455 | | | 531 | | |
| Total population | 5,525 | 2,765 | 2,760 | 1,500 | 750 | 750 |
| English only | 5,055 | 2,530 | 2,525 | 1,330 | 685 | 645 |
| French only | 95 | 55 | 35 | 25 | 10 | 15 |
| English and French | 20 | 10 | 10 | - | - | - |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Other language(s) | 360 | 170 | 190 | 135 | 55 | 80 |
| Total population | 5,525 | 2,760 | 2,760 | 1,500 | 750 | 750 |
| English only | 5,185 | 2,580 | 2,605 | 1,435 | 725 | 715 |
| French only | - | - | - | - | - | - |
| English and French | 340 | 185 | 160 | 60 | 25 | 35 |
| Neither English nor French | - | - | - | - | - | - |
| Total population | 5,530 | 2,765 | 2,765 | 1,500 | 750 | 750 |
| English | 5,390 | 2,695 | 2,690 | 1,420 | 720 | 700 |
| French | 15 | 20 | - | - | - | - |
| Non-official language | 85 | 35 | 45 | 75 | 30 | 45 |
| English and French | 15 | - | 10 | - | - | - |
| English and non-official language | 20 | - | 10 | 10 | - | - |
| French and non-official language | - | - | - | - | - | - |
| English; French and non-official language | - | - | - | - | - | - |
| Total population | 5,525 | 2,765 | 2,765 | 1,500 | 750 | 750 |
| Non-immigrants | 5,255 | 2,635 | 2,625 | 1,460 | 730 | 725 |
| Immigrants | 270 | 135 | 135 | 45 | 15 | 25 |
| Before 1991 | 235 | 125 | 110 | 30 | 10 | 20 |
| 1991 to 2000 | 30 | 10 | 25 | 10 | 10 | - |
| 2001 to 2006 | 10 | - | - | - | - | - |
| Non-permanent residents | - | - | - | - | - | - |
| Total population | 5,530 | 2,765 | 2,760 | 1,500 | 750 | 750 |
| Canadian citizens | 5,465 | 2,740 | 2,725 | 1,495 | 750 | 745 |
| Canadian citizens under age 18 | 1,340 | 710 | 625 | 400 | 205 | 195 |
| Canadian citizens age 18 and over | 4,125 | 2,025 | 2,095 | 1,090 | 540 | 550 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Not Canadian citizens | 65 | 25 | 40 | 10 | - | 10 |
| Total population 15 years and over | 4,490 | 2,230 | 2,255 | 1,180 | 585 | 595 |
| 1st generation | 260 | 125 | 135 | 40 | 15 | 25 |
| 2nd generation | 720 | 340 | 375 | 195 | 85 | 110 |
| 3rd generation or more | 3,505 | 1,755 | 1,750 | 940 | 490 | 455 |
| Total population 1 year and over | 5,470 | 2,740 | 2,725 | 1,480 | 740 | 745 |
| Lived at the same address 1 year ago | 4,660 | 2,360 | 2,300 | 1,280 | 630 | 645 |
| Proportion living at same residence one year ago | 85% | | | 86% | | |
| Lived within the same province or territory 1 year ago; but changed addresses within the same census subdivision (municipality) | 490 | 215 | 270 | 75 | 40 | 35 |
| Lived within the same province or territory 1 year ago; but changed addresses from another census subdivision (municipality) within the same province or territory | 65 | 35 | 35 | 65 | 35 | 30 |
| Lived in a different province or territory 1 year ago | 230 | 115 | 120 | 60 | 35 | 25 |
| Lived in a different country 1 year ago | 15 | 10 | - | - | - | - |
| Total population 5 years and over | 5,225 | 2,600 | 2,620 | 1,410 | 690 | 715 |
| Lived at the same address 5 years ago | 3,150 | 1,640 | 1,510 | 950 | 460 | 485 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Proportion living at same residence five years ago | 60% | | | 67% | | |
| Lived within the same province or territory 5 years ago; but changed addresses within the same census subdivision (municipality) | 1,010 | 435 | 580 | 165 | 80 | 80 |
| Lived within the same province or territory 5 years ago; but changed addresses from another census subdivision (municipality) within the same province or territory | 440 | 210 | 230 | 125 | 60 | 65 |
| Lived in a different province or territory 5 years ago | 610 | 315 | 290 | 175 | 95 | 85 |
| Lived in a different country 5 years ago | 10 | - | 10 | - | - | 10 |
| Total Aboriginal and non-Aboriginal identity population | 5,525 | 2,760 | 2,760 | 1,500 | 750 | 750 |
| Aboriginal identity population | 910 | 425 | 480 | 245 | 115 | 125 |
| Non-Aboriginal identity population | 4,615 | 2,335 | 2,285 | 1,260 | 630 | 625 |
| Total population 15 years and over | 4,490 | 2,230 | 2,255 | 1,180 | 585 | 595 |
| No certificate; diploma or degree | 1,490 | 775 | 710 | 410 | 235 | 180 |
| High school certificate or equivalent | 1,235 | 575 | 660 | 300 | 145 | 155 |
| Apprenticeship or trades certificate or diploma | 600 | 425 | 175 | 130 | 85 | 45 |



| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| College; CEGEP or other non-university certificate or diploma | 715 | 255 | 460 | 240 | 90 | 150 |
| University certificate or diploma below the bachelor level | 115 | 35 | 85 | 25 | 10 | 20 |
| University certificate; diploma or degree | 330 | 160 | 165 | 70 | 20 | 45 |
| Total population aged 15 to 24 | 780 | 410 | 365 | 215 | 115 | 100 |
| No certificate; diploma or degree | 430 | 240 | 185 | 120 | 65 | 55 |
| High school certificate or equivalent | 290 | 130 | 155 | 80 | 45 | 35 |
| Apprenticeship or trades certificate or diploma | 30 | 25 | - | 10 | - | - |
| College; CEGEP or other non-university certificate or diploma | 20 | 10 | 10 | 10 | - | 10 |
| University certificate or diploma below the bachelor level | - | - | - | - | - | - |
| University certificate; diploma or degree | 10 | - | 10 | - | - | - |
| Total population aged 25 to 34 | 620 | 270 | 350 | 165 | 80 | 80 |
| No certificate; diploma or degree | 130 | 55 | 75 | 35 | 25 | 10 |
| High school certificate or equivalent | 225 | 95 | 130 | 60 | 25 | 30 |
| Apprenticeship or trades certificate or diploma | 90 | 70 | 20 | 15 | - | - |
| College; CEGEP or other non-university certificate or diploma | 90 | 20 | 65 | 40 | 15 | 30 |
| University certificate or diploma below the bachelor level | - | - | - | - | 10 | - |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| University certificate; diploma or degree | 85 | 25 | 60 | 15 | - | - |
| Total population aged 35 to 64 | 2,400 | 1,240 | 1,160 | 620 | 315 | 305 |
| No certificate; diploma or degree | 580 | 350 | 225 | 155 | 105 | 50 |
| High school certificate or equivalent | 620 | 305 | 315 | 145 | 70 | 75 |
| Apprenticeship or trades certificate or diploma | 390 | 240 | 145 | 90 | 55 | 30 |
| College; CEGEP or other non-university certificate or diploma | 525 | 205 | 320 | 170 | 70 | 100 |
| University certificate or diploma below the bachelor level | 90 | 20 | 70 | 15 | - | 15 |
| University certificate; diploma or degree | 195 | 110 | 80 | 45 | 10 | 35 |
| Total population 15 years and over | 4,485 | 2,230 | 2,260 | 1,180 | 590 | 590 |
| No postsecondary certificate; diploma or degree | 2,720 | 1,355 | 1,365 | 715 | 385 | 335 |
| Education | 165 | 60 | 110 | 50 | 10 | 40 |
| Visual and performing arts; and communications technologies | 25 | - | 20 | - | - | - |
| Humanities | 20 | 15 | - | 15 | - | 10 |
| Social and behavioural sciences and law | 115 | 35 | 75 | 20 | - | 15 |
| Business; management and public administration | 320 | 60 | 255 | 100 | 15 | 85 |
| Physical and life sciences and technologies | 35 | 15 | 25 | - | 10 | - |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Mathematics; computer and information sciences | 25 | 10 | 15 | 10 | 10 | 10 |
| Architecture; engineering; and related technologies | 590 | 565 | 20 | 135 | 130 | 10 |
| Agriculture; natural resources and conservation | 40 | 30 | 10 | 10 | 10 | - |
| Health; parks; recreation and fitness | 295 | 25 | 270 | 70 | 10 | 60 |
| Personal; protective and transportation services | 130 | 50 | 80 | 40 | 20 | 25 |
| Other | - | - | - | - | - | - |
| Total population 15 years and over | 4,490 | 2,230 | 2,255 | 1,180 | 585 | 595 |
| No postsecondary certificate; diploma or degree | 2,725 | 1,355 | 1,370 | 715 | 380 | 335 |
| Postsecondary certificate; diploma or degree | 1,765 | 875 | 890 | 465 | 205 | 260 |
| Inside Canada | 1,645 | 800 | 840 | 445 | 200 | 250 |
| Outside Canada | 120 | 70 | 45 | 15 | - | 10 |
| Total population 15 years and over | 4,490 | 2,230 | 2,260 | 1,180 | 585 | 595 |
| In the labour force | 3,175 | 1,705 | 1,475 | 830 | 445 | 380 |
| Employed | 3,030 | 1,630 | 1,400 | 770 | 425 | 345 |
| Unemployed | 145 | 70 | 75 | 55 | 25 | 35 |
| Not in the labour force | 1,310 | 525 | 785 | 350 | 140 | 215 |
| Participation rate | 71 | 77 | 65 | 70 | 76 | 64 |
| Employment rate | 68 | 73 | 62 | 65 | 73 | 58 |
| Unemployment rate | 5 | 4 | 5 | 7 | 6 | 9 |
| Total experienced labour force 15 years and over | 3,135 | 1,680 | 1,450 | 810 | 440 | 370 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|---|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| A Management occupations | 210 | 110 | 100 | 65 | 25 | 35 |
| B Business; finance and administration occupations | 315 | 55 | 260 | 100 | 15 | 85 |
| C Natural and applied sciences and related occupations | 105 | 100 | 10 | 25 | 20 | 10 |
| D Health occupations | 205 | 25 | 175 | 30 | - | 25 |
| E Occupations in social science; education; government service and religion | 190 | 40 | 155 | 55 | 10 | 50 |
| F Occupations in art; culture; recreation and sport | 30 | - | 30 | 10 | - | 10 |
| G Sales and service occupations | 910 | 255 | 660 | 220 | 70 | 155 |
| H Trades; transport and equipment operators and related occupations | 620 | 595 | 30 | 160 | 160 | 10 |
| I Occupations unique to primary industry | 340 | 330 | 15 | 90 | 90 | - |
| J Occupations unique to processing; manufacturing and utilities | 195 | 175 | 15 | 50 | 45 | 10 |
| Total experienced labour force 15 years and over | 3,130 | 1,680 | 1,450 | 810 | 440 | 370 |
| Agriculture and other resource-based industries | 390 | 360 | 30 | 100 | 90 | 15 |
| Construction | 165 | 150 | 15 | 25 | 20 | 10 |
| Manufacturing | 655 | 550 | 105 | 165 | 145 | 20 |
| Wholesale trade | 75 | 35 | 40 | 20 | 10 | - |
| Retail trade | 440 | 190 | 245 | 135 | 50 | 80 |
| Finance and real estate | 65 | 15 | 50 | 15 | - | 20 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Health care and social services | 350 | 45 | 310 | 80 | 10 | 75 |
| Educational services | 145 | 25 | 120 | 55 | 10 | 45 |
| Business services | 245 | 145 | 100 | 55 | 35 | 20 |
| Other services | 600 | 165 | 435 | 165 | 75 | 95 |
| Population 15 years and over reporting hours of unpaid work | 4,225 | 2,030 | 2,195 | 1,110 | 540 | 570 |
| Population 15 years and over reporting hours of unpaid housework | 4,185 | 2,010 | 2,180 | 1,090 | 525 | 565 |
| Population 15 years and over reporting hours looking after children without pay | 1,755 | 770 | 985 | 475 | 220 | 250 |
| Population 15 years and over reporting hours of unpaid care or assistance to seniors | 830 | 350 | 485 | 280 | 125 | 155 |
| Total population 15 years and over who worked since 2005 | 3,415 | 1,810 | 1,600 | 870 | 470 | 405 |
| English | 3,395 | 1,805 | 1,590 | 870 | 465 | 405 |
| French | 10 | 10 | - | - | - | - |
| Non-official language | - | - | 10 | - | 10 | - |
| English and French | - | - | - | - | - | - |
| English and non-official language | - | - | - | - | - | - |
| French and non-official language | - | - | - | - | - | - |
| English; French and non-official language | - | - | - | - | - | - |
| Total employed labour force 15 years and over | 3,030 | 1,630 | 1,400 | 765 | 420 | 345 |
| Worked at home | 90 | 25 | 65 | 20 | 10 | 10 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Worked outside Canada | - | - | - | - | - | - |
| No fixed workplace address | 285 | 235 | 45 | 55 | 40 | 10 |
| Worked at usual place | 2,655 | 1,375 | 1,285 | 695 | 365 | 325 |
| Worked in census subdivision (municipality) of residence | 1,700 | 635 | 1,060 | 145 | 55 | 85 |
| Worked in a different census subdivision (municipality) within the census division (county) of residence | 695 | 605 | 95 | 50 | 30 | 15 |
| Worked in a different census division (county) | 25 | 10 | 20 | 10 | 10 | - |
| Worked in a different province | 230 | 120 | 105 | 490 | 275 | 215 |
| Total employed labour force 15 years and over with a usual place of work or no fixed workplace address | 2,940 | 1,605 | 1,330 | 750 | 415 | 335 |
| Car; truck; van; as driver | 2,010 | 1,130 | 880 | 585 | 335 | 250 |
| Car; truck; van; as passenger | 250 | 125 | 120 | 40 | 25 | 20 |
| Public transit | 75 | 35 | 40 | 10 | - | - |
| Walked or bicycled | 505 | 250 | 255 | 95 | 40 | 55 |
| All other modes | 100 | 70 | 35 | 15 | 15 | - |
| Total population | 5,530 | 2,765 | 2,765 | 1,500 | 750 | 750 |
| Total visible minority population | 65 | 30 | 30 | 15 | 10 | 10 |
| Chinese | - | - | - | 10 | 10 | - |
| South Asian | 15 | 15 | - | - | - | 10 |
| Black | 10 | - | - | - | - | - |
| Filipino | 30 | 10 | 20 | - | - | - |
| Latin American | - | - | - | - | - | - |
| Southeast Asian | - | - | - | - | - | - |



| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Arab | - | - | - | - | - | - |
| West Asian | - | - | - | - | - | - |
| Korean | - | - | - | - | - | - |
| Japanese | 10 | 10 | - | - | - | - |
| Visible minority; n.i.e. | - | - | - | - | 10 | - |
| Multiple visible minority | - | - | - | - | - | - |
| Not a visible minority | 5,460 | 2,730 | 2,730 | 1,485 | 745 | 740 |
| Persons 15 years and over with earnings (counts) | 3,285 | 1,755 | 1,535 | 880 | 475 | 405 |
| Median earnings - Persons 15 years and over (\$) | 30,903 | 51,139 | 17,224 | 29,480 | 50,485 | 18,998 |
| Persons 15 years and over with earnings who worked full year; full time (counts) | 1,935 | 1,195 | 735 | 455 | 275 | 180 |
| Median earnings - Persons 15 years and over who worked full year; full time (\$) | 48,262 | 57,676 | 29,324 | 50,343 | 60,276 | 31,540 |
| Persons 15 years and over with income (counts) | 4,280 | 2,130 | 2,145 | 1,140 | 570 | 570 |
| Median income - Persons 15 years and over (\$) | 26,245 | 43,735 | 18,188 | 27,389 | 44,369 | 19,931 |
| Median income after tax - Persons 15 years and over (\$) | 23,828 | 36,626 | 16,869 | 24,513 | 37,301 | 18,633 |
| Composition of total income (100%) | 100 | 100 | 100 | 100 | 100 | 100 |
| Earnings - As a % of total income | 82 | 87 | 73 | 81 | 87 | 71 |
| Government transfers - As a % of total income | 11 | 7 | 20 | 10 | 6 | 19 |

| Characteristics | Flin Flon (Part) - City (Census subdivision) | | | Creighton - Town (Census subdivision) | | |
|--|--|-------------|---------------|---------------------------------------|-------------|---------------|
| | <i>Total</i> | <i>Male</i> | <i>Female</i> | <i>Total</i> | <i>Male</i> | <i>Female</i> |
| Other money - As a % of total income | 7 | 6 | 8 | 8 | 8 | 10 |
| Income status of all persons in private households (counts) | 5,520 | 2,755 | 2,760 | 1,500 | 745 | 750 |
| % in low income before tax - All persons | 14 | 13 | 14 | 8 | 7 | 10 |
| % in low income after tax - All persons | 10 | 11 | 9 | 6 | 5 | 7 |
| % in low income before tax - Persons less than 18 years of age | 24 | 27 | 21 | 12 | 12 | 13 |
| % in low income after tax - Persons less than 18 years of age | 19 | 25 | 14 | 10 | 7 | 10 |

Source: Statistics Canada. 2007. 2006 Community Profiles. 2006 Census. Statistics Canada Catalogue no. 92-591-XWE. Ottawa. Released March 13 2007. <http://www12.statcan.ca/census-recensement/2006/dp-pd/prof/92-591/index.cfm?Lang=E> as of April 8, 2009