



ÉcoTerra™: **Approaching Net Zero through** **Integrated Design**

"In today's market, there's a sweet spot between net-zero energy efficiency and what people are willing to pay, and get good return on their investment," says Bradley Berneche, President of Alouette Homes, "and while there are other ideas we could implement, there's also a trade-off between efficiency and complexity."

With assistance and expertise from CMHC and Concordia University, Alouette Homes completed the first EQuilibrium™ Sustainable Housing Demonstration Initiative project in 2007. The home, called ÉcoTerra™, is situated in a wooded area

in Eastman, Quebec, and features a building-integrated photovoltaic/thermal (BIPV/T) roof that not only generates electricity, but also channels hot air under the roof and into the house to contribute to space heating, heating the concrete slab under the home, and drying clothes. To reduce energy costs while maintaining occupant comfort, ÉcoTerra™ makes use of a highly insulated and airtight building envelope, geothermal heat pump, a heat-recovery ventilator, motorized exterior awnings and passive solar design. Sensors placed strategically around the home connect to an Energy Management Control System (EMCS) that automatically makes real-time decisions that help save energy.

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About the National Housing Research Committee

The National Housing Research Committee (NHRC), established in 1986, is made up of federal, provincial and territorial, municipal, industry, social housing and academic community representatives. Its objectives include:

- identifying priority areas for housing-related research or demonstration,
- fostering greater co-operation, developing partnerships and minimizing overlap in research activities,
- encouraging support for housing research,
- promoting the dissemination, application and adoption of research results.

In addition to the Full Committee, the NHRC also operates through working groups to exchange information, discuss research gaps and undertake research projects. Currently, working groups meet on housing data, homelessness, sustainable housing and communities and distinct needs. The NHRC participants also contribute articles to the *NHRC Newsletter*, which is produced twice a year, and network through their online community: www.nhrc-cnrl.ca.

The NHRC co-chairs are Steve Mennill of Canada Mortgage and Housing Corporation (CMHC) and Kildy Yuen of Alberta Housing and Urban Affairs. CMHC provides the Secretariat for the Committee and produces this Newsletter.

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Despite the number of novel features, Alouette Homes opted for a modular construction approach in building ÉcoTerra™: they prefabricated each of the modules at their factory, trucked them to the Eastman site and used a crane to place the modules onto a poured concrete basement foundation. Apart from reducing construction time and waste material, the approach allowed Alouette to bring its specialists and suppliers together in one place, leading to better quality control and an ability to adapt some of the systems, usually used in industrial applications, to a single-detached home.

The approach also presented challenges. "One of the limits of modular construction was that, because of the need to transport it on trucks, the roof was limited to a 30-degree pitch," says CMHC Senior Researcher Rémi Charron. "Snow doesn't shed well at that angle and that can

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affect the performance of the electricity generating photovoltaic system integrated into the roof.” Monitoring of the roof shows that it performed best from spring to fall.

The EMCS represents another trade-off in refining integrated systems: a digital panel interface allows the occupants to adjust the systems to their own comfort but, as Charron points out, its original designer (Regulvar) had to scale back the technology from industrial use to make it intuitive for homeowners. “The house has a lot of technology and options that are controlled to optimize performance,” he says. “Given that the occupants are not experts in control systems, you have to find a balance in what you’re including in the controls.”

But the EMCS represents great potential for further improvement, says Berneche. “We’ll soon be trying to implement an interface that gives a more direct and real-time idea of what’s happening against the norm.” Software will also be able to take weather forecasts into account when regulating heating and cooling systems.

He also sees great potential in using modular construction, mainly in bringing expertise together and in saving costs, which will help to encourage more people to adopt sustainable-housing features. “It’s hard to make a consumer-driven argument to spend \$90,000 more to save \$2,000 a year in energy costs. The industry is trying

to find all kinds of ways to justify the cost, but it comes down to what clients can justify.”

While Alouette was able to create ÉcoTerra™ as a marketable home, Berneche found that the main benefits to his company were not financial. “It’s been an enriching experience, in terms of giving us great contacts, concentrating our know-how and professionalism,” he says. And Alouette has already used what it’s learned from ÉcoTerra™ to launch a new product line, ÉcoTerra™ Walls, which can be readily used by other developers.

Other technologies will take time to become more transferable, says Charron. “The industry is just getting to a standard PV system to generate electricity—but if you want to modify it to also extract heat, for example, you’ll face training issues, and need new modelling tools to predict performance.” By bringing different types of expertise together, the modular approach can only accelerate this process. ■

These and other features of ÉcoTerra™ are detailed in two EQuilibrium™ Housing Insight issues (#67309 and #67307) available on the CMHC website. For more information, contact Thomas Green at tgreen@cmhc.ca or 613-748-2340, or Bradley Berneche at bberneche@maisonalouette.com or 450-531-1561, ext. 223.

Do Residential Gas Fireplaces Complement or Compromise the Effectiveness of Furnaces?

Many Canadian homeowners will be familiar with the effect: when the winter sun shines directly on a poorly placed thermostat, it registers a higher temperature and shuts the furnace off—allowing other parts of the house to become uncomfortably cool. But what if the thermostat is near another source of heat, such as a gas fireplace?

Researchers at the Canadian Centre for Housing Technology (CCHT)—a partnership between CMHC, the National Research Council and Natural Resources Canada—had observed a similar

effect when testing technologies on the CCHT Twin House facility, which consists of two houses: a “test” and a “reference” house, both featuring an identical four-bedroom, R-2000 design commonly available in the Ottawa area. “We’ve tested more than 40 technologies in the houses, which had fireplaces installed since the beginning, and we’d seen some secondary effects with other technologies, where a heat source near the thermostat caused rooms to get cold,” says Marianne Armstrong, Research Officer at the NRC Institute for Research in Construction.

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This could be a concern for the many Canadian households who own a gas-burning fireplace.

So, with funding from CMHC, Armstrong and her colleagues at CCHT decided to test the effects of the facility's direct vent, natural-gas fireplace, which is located in the main-floor family room and features a pilot light and a circulating fan. They benchmarked the space heating energy consumption of the two houses, setting both houses' thermostats to 22°C, and then ran several tests to assess the impact of different fireplace and furnace operating scenarios on the gas consumption of the test house:

- evening fireplace operation, with the furnace fan on continuously, providing air circulation;
- evening fireplace operation, with the furnace fan off in both houses;
- continuous fireplace operation, controlled by a dedicated thermostat set 2°C above the set point of the central heating system thermostat, with the furnace fan on; and
- continuous pilot-light and furnace-fan operation only.

Fireplace operation was shown to increase gas consumption by about the same amount, whether or not there was continuous air circulation by the furnace fan. As Armstrong puts it, "Even though the fireplace was consuming a lot of gas, it tended to offset the gas consumption of the furnace, so even though overall energy consumption did increase, it was not as much as we expected." Running the fireplace continuously reduced furnace operation the most. However, with the fireplace thermostat set to 22°C, evening fireplace operation caused the air temperatures in the second-floor bedrooms to be reduced by as much as 2°C as the furnace did not need to operate as frequently.

Armstrong cautions that not all Canadian homes are as efficient or as openly designed as the CCHT facility, and some newer fireplaces are more efficient. Still, she says that the findings can help homeowners better understand their heating systems:



The test house fireplace

"Pay attention to where the fireplace is located with respect to the thermostat," she says. "It's going to affect when the thermostat calls for heat, and that in turn is going to affect temperatures in other rooms. However efficient everything may be in your house, your overall efficiency depends just as much on how you run it."

And the great number of variables leaves researchers much more room to explore. "We'd like to look at the impact of a more efficient fireplace as well," she adds, "and one avenue we didn't explore was what would happen if we left only the fireplace running: if a furnace failed, would the fireplace heat the whole house? How much would other rooms cool off?" ■

A Research Highlight, published on the CMHC website (#67314), provides more details on the findings, including average daily gas consumption rates and year-round temperature differences. The full CCHT report is available at www.ccht-cctr.gc.ca. For more information, contact Marianne Armstrong at marianne.armstrong@nrc-cnrc.gc.ca or 613-991-0967.

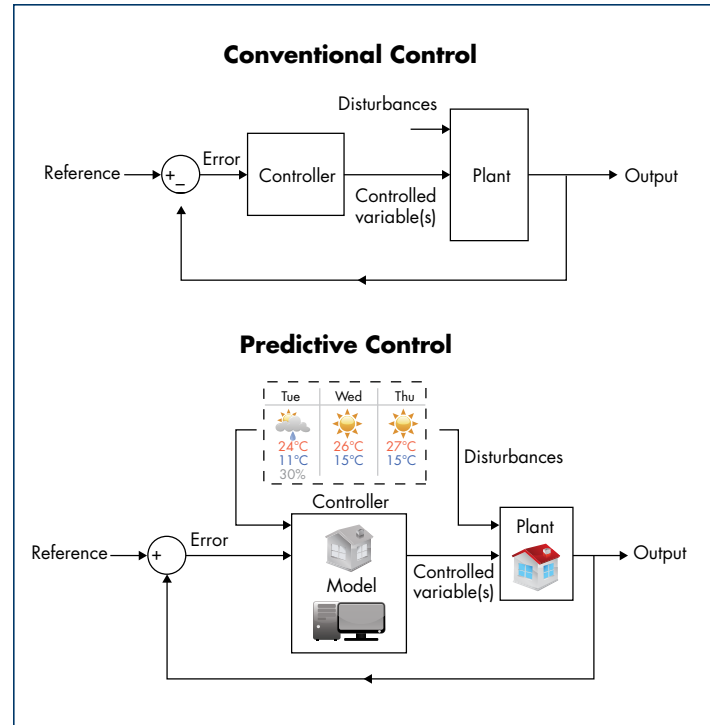
Advances in Modelling and Control for Solar Buildings

Recent research by Ph.D. candidates from Concordia University's Building Engineering program funded by the NSERC Solar Buildings Strategic Research Network, a unique research organization dedicated to developing design concepts and enabling technologies for cost-effective, solar-optimized buildings, could have significant bearing on the construction of solar homes such as the ÉcoTerra™ project that was designed and constructed as a part of CMHC's EQuilibrium™ Sustainable Housing Demonstration Initiative (see page 1). The Network brings together 24 top Canadian researchers from 11 Canadian universities and experts from Natural Resources Canada (NRCan), CMHC and Hydro-Québec.

Predictive control for solar homes

Though solar energy can be delivered to a house through windows, photovoltaic (PV) panels and solar thermal hot water systems, it is impacted by the variability of solar radiation. Simply put: no sun, no solar energy. To get around this problem, energy storage and control strategies can be used to capture and store solar energy when it is available and then release it later into the home when it is needed. Energy storage can be accomplished in several ways: by using batteries, with thermal-energy storage (TES) such as water tanks or phase-change materials, or in the building's thermal mass itself. The utility grid can also mimic a "storage" device: a surplus of electricity generation can be delivered to the grid; conversely, the grid can also supply electricity back to the house when needed. Although residential control systems are currently available that can help capture, store and release solar energy, they are generally reactive in nature and do not always respond quickly enough to optimize overall system performance. Control systems that are more proactive, or predictive, may improve the efficiency and effectiveness of solar energy capture, storage and release processes thereby reducing the need for purchased energy and providing improved occupant comfort conditions.

In his Ph.D. thesis at Concordia, Dr. Jose Candanedo, now a researcher with NRCan, addressed the use of strategies to use weather and user-load forecasts to calculate expected energy



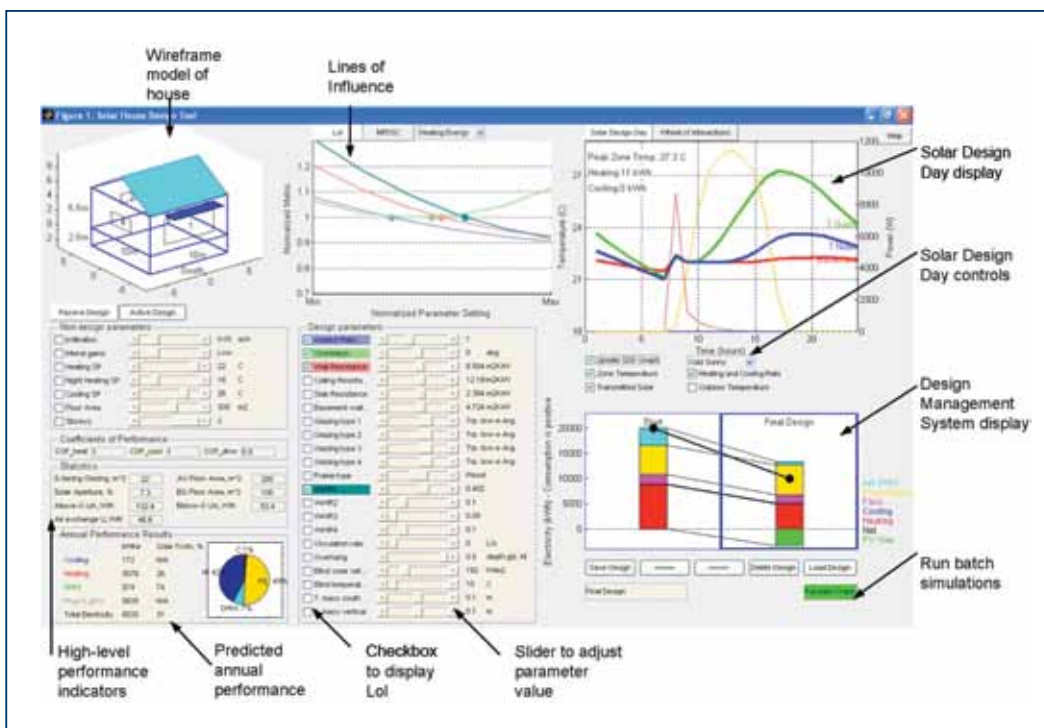
1. Conventional control versus predictive control

requirements and availability, and manage temperature fluctuations to maximize thermal storage use, maintain thermal comfort, and reduce peak loads in solar homes (see figure 1). Consequently, designers could avoid oversizing of HVAC equipment, while the effectiveness of systems such as heat pumps combined with an energy-storage device could be increased.

Dr. Candanedo investigated the use of simplified building models to implement model predictive control (MPC) algorithms to control the temperature of a house, using detailed building simulations to control a radiant floor heating system and the position of a shading device to prevent overheating. He also developed a predictive control algorithm for a TES tank heated by a BIPV/T-assisted heat pump. The results obtained in this study are promising, and encourage investigation of other predictive control applications in solar homes.

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2. The Ecos user interface

Development of a new design tool for solar homes

The design of several houses constructed under the EQuilibrium™ Housing Demonstration Initiative revealed some limitations in existing design tools—such as oversimplified methods for assessing passive solar performance, a lack of integrated active solar system models, and an emphasis on determining the performance of a specific design, rather than supporting the design process.

To address these needs, Dr. Liam O'Brien, who has since become an Assistant Professor at Carleton University, developed Ecos, a design methodology and tool with a different approach. His objectives were to create a detailed mathematical model that would better represent the building physics of passive solar houses,

while also providing features, such as real-time feedback and graphs that show trends over the design space, that would allow exploratory design.

Dr. O'Brien used extensive parametric analysis and comparison of the ÉcoTerra™ design to develop the model, exploring the effect of dividing the house into thermal zones, airflow rates between these zones, and comparing the effect of grouping the windows versus modelling them individually. The objective was to simplify the model while ensuring high accuracy.

Ecos' interface (see figure 2) features intuitive controls for key design variables, while showing how one or more design variables can be optimized.

Users can also take into account the effect of critical weather conditions on key performance metrics such as indoor air temperature—and use them to fine-tune window area, insulation levels and thermal mass. Being able to store and compare various designs allows unprecedented control and flexibility in the design of high-performance solar houses. ■

Candanedo was supervised by Andreas Athienitis and O'Brien by Athienitis and Ted Kesik from the University of Toronto. For more information about the NSERC Solar Buildings Strategic Research Network, contact Dr. Andreas Athienitis, Scientific Director and Professor at Concordia University's Department of Building, Civil and Environmental Engineering, at 514-848-2424, ext. 8791 or aathieni@encs.concordia.ca, or visit the Network's website at www.solarbuildings.ca.

CMHC's *Mold in Housing* series Helps First Nations Better Manage Mold-Related Issues

"The mold problem in homes can be both complex and challenging," says CMHC Senior Researcher Regina De La Campa. "Mold growth depends on humidity and moisture levels inside the house. Elevated humidity and moisture levels can result from water coming into the home from the outside, such as from flooding, poor drainage around the foundation, rain penetration through damaged windows, or from inside sources, such as plumbing leaks or daily activities like bathing, showering and cooking. If the excessive moisture is not removed quickly, mold will grow."

So, what can be done to deal with mold? "You first have to understand where the moisture problem is coming from and deal with it as soon as possible," says De La Campa. "A plan that focuses on dealing with existing situations and then preventing future problems needs to be put in place."

Regina De La Campa was responsible for leading the development of a new series of CMHC publications on mold as part of the First Nations National Mold Strategy—a partnership among Health Canada, Aboriginal Affairs and Northern Development Canada, the Assembly of First Nations and CMHC. The goal of the strategy is to address the mold problem in on-reserve housing by raising awareness of mold prevention through education and distribution of information; helping communities deal with mold problems; and providing guidance, training and support for capacity building to deal with mold in these communities.

CMHC has prepared a *Mold in Housing* series for use by First Nation communities. These publications are available on the CMHC website as three separate guides: the *Home Occupants' Guide*, the *Housing Managers' Guide* and the more technical *Guide to Mold-Resistant Renovations and New Construction*. Each provides sound advice on identifying and combating mold-related problems.

Also included in the *Housing Managers' Guide* is a household investigation tool for mold, which can help housing managers examine and document a building's history,

characteristics and mold issues. The guides of the *Mold in Housing Series* then can be used to assess and address what kind of mold remediation may be necessary.

CMHC is also helping to profile, through case studies, how First Nation communities have addressed their mold problems. "The case studies highlight the different approaches that communities have taken to address mold," says De La Campa. "Some approaches focus on training and building capacity, while others are relying on alternative technologies, such as insulated concrete forms and heat-recovery ventilators to keep houses warm and dry. First Nation communities are taking matters into their own hands, and they have been successful."

Two case studies are now published, and De La Campa expects to produce more. She notes that the communities that have seen some success in dealing with mold are interested in helping, and sharing their knowledge with other First Nation communities.

And having more success stories can only help. "There are more than 600 First Nation communities across the country, so there could be many more good news stories to come," she says. ■

The *Mold in Housing* series is available on the CMHC website (publications #67237, 67299 and 67301), as are the case studies for Membertou First Nation (#67294) and Wikwemikong First Nation (#67296). For more information, contact Regina De La Campa at rdelacam@cmhc.ca or 613-748-4138.



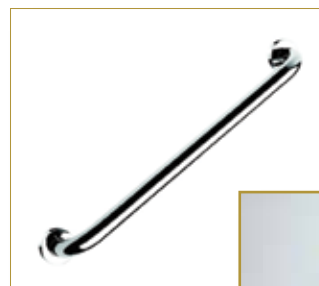
Smart Grab Bars: Using Artificial Intelligence to Prevent Bathroom Falls

"If grab bars were always in the bathroom, they'd become part of the expected environment, and they wouldn't be associated with disability," says Dr. Paulette Guitard, an occupational therapist and Director of the Occupational Therapy Program at University of Ottawa's School of Rehabilitation Sciences. The use of grab bars can prevent many falls in the bathroom—a serious concern for seniors but stigma deters people from installing them. As a result many people never develop a habit of using them while their reflexes are still quick.

Dr. Guitard and a team of researchers at the University of Ottawa embarked on a study to determine how artificial-intelligence features in a grab bar could encourage its use. In 2008, they conducted a pilot test of 10 adults, using a prototype "smart" grab bar that would emit visual or auditory cues, or both, when sensors detected motion as the individuals approached the bathtub. The participants responded well to the cues, and their feedback prompted some refinements to the prototype.

In 2009-2010, the team conducted a more comprehensive study involving 86 healthy adults over 60 years old. Each participant was asked to enter and exit a normal bathtub 40 times, in the proximity of a smart grab bar; their use of the bar was recorded for each trial. To establish a baseline, the first five transfers involved no cue from the bar; the following 30 transfers involved occasional cues from the grab bars (32 per cent of the time): one group received a visual cue (a flashing light) from the bar, the second received an auditory cue (a male voice), and a third received both; a control group received no cues. To determine whether the experiment had any learning effects, no cues were presented during the final five transfers.

The team videotaped the transfers and gathered feedback from the participants. The results showed that the combined audio and visual cues were most effective (76-per-cent use), followed by sound (60 per cent) and lights (48 per cent), against 28 per cent for the control group. Overall, grab-bar use increased by 37 per cent between the first and last five transfers. In follow-up interviews with 53 of the participants, most said they would consider using grab bars in the future, though only seven had already purchased one. Participants also expressed a preference for visual cues over the more effective audio cues.



Regular grab bar



Smart grab bar prototype

As a next step, Dr. Guitard would like to improve the prototype—getting all the light and sound features installed inside a single, self-contained unit, rather than relying on external speakers, for example. Likewise, a feature that allows one to record a familiar caregiver's voice might lead to better acceptance. The findings also suggest a number of ways that the idea of smart grab bars could be advanced through further research, including trials with specialized clientele, such as people with dementia, or studying how many visual or audio cues are required before use of the grab bars becomes a habit—and how long that habit persists after the cue is removed.

Dr. Guitard acknowledges that any change involving stigma will have broader policy and educational implications. "Right now it's not normal to have a grab bar, so it attracts a lot of attention; it suggests that one is frail, and so people don't want to use them," she says, "but you don't use a car seatbelt because you have a disability; it's a preventative measure, and putting it on is part of your routine." She suggests that society could take a similar route of familiarizing itself with grab bars. ■

A Research Highlight, available on the CMHC website (#67275), provides more detail on the study of smart grab bars. For more information, contact Dr. Guitard at guitardp@uottawa.ca or 613-562-5408.

The Benefits of Congregate Living for People with Mental Illness

While there has been much research into the type of housing and supports that people with mental-health issues need, the benefits of congregate living have been relatively unexplored in Canada, until a study by the Toronto-based Centre for Addiction and Mental Health (CAMH), in collaboration with Regeneration Community Services and Mainstay Housing, was released in 2011. CMHC supported this study.

"Much of the earlier literature focused on housing that had more than one person per bedroom; that's very different from having an individual space," says Dr. Joan Nandlal, who led the study at CAMH and is now Executive Director at the John Howard Society of Waterloo-Wellington. From this literature, she says, emerged an idealized notion of living in self-contained apartments—a kind of independence that people with mental illnesses might aspire to.

She posited that congregate living—a housing arrangement where each tenant has a private bedroom but shares other spaces in common—might achieve the desired need for privacy while providing access to social support. Furthermore, congregate living may be a better investment, if it costs less to build and operate than self-contained apartments.

The CAMH team interviewed and gathered feedback from 85 people with mental illness: 30 who lived in congregate housing, 18 who had moved from congregate housing to self-contained apartments, and 37 who had been in self-contained apartments for more than five years.

All three groups reported about the same level of satisfaction with their housing. Both those in congregate housing and those who had moved from it generally viewed support and connectedness as benefits of congregate housing, while viewing privacy, choice and control as advantages of self-contained apartments. With appropriate supports and features, such as dispute-resolution mechanisms and a variety of common spaces, congregate living could achieve self-contained living advantages as well.

Though the idea of an informal support network lies at the core of congregate living, Dr. Nandlal notes that many of the tenants had a very different idea of what constitutes "support": those who provided financial and professional help were often cited as part of the tenants' support network, but their housemates—typically the ones who resolve disputes, talk through issues and help them



move—rarely were. "They're typically not putting their own peers in the same class as their professional help," she says. "Perhaps it has to do with social-identity politics: one tenant might say of another, 'He helped me move, but he's so messed up, it wouldn't be appropriate for him to support me.'"

While the study's findings lend more credibility to the option of congregate living, Dr. Nandlal cautions that "it's probably not best for everyone," given the varying degrees of independence of people with mental illness. Choice is a core consideration.

And many questions remain, she adds: "The congregate setting warrants further scrutiny. We looked at a house model with four to six people, but is that better than 14? What's the optimal size that produces benefits of privacy, but without crowding?" Another variable that warrants further exploration involves the amount of common space. "You could have an apartment-style setting, with a common area for meals and programming, for example, or a house with a sun room, living area and garden, where there are lots of choices and places to go to." She suggests that choice between common areas—just as in an ordinary family home—has a beneficial effect on tenants. Finally, the kind of formal structures and mechanisms in place to support the tenant's decision-making and resolution of issues could also affect the quality and perception of congregate living. ■

A Research Highlight, available on the CMHC website (#67272), provides more detail on the study. For more information, contact Dr. Joan Nandlal at joannandlal@waterloo.johnhoward.on.ca or 519-743-6071, ext. 211.

Establishing Linkages between Poor Housing and Poor Health

While previous research had shown the poor health status of homeless individuals, the health status of vulnerably housed individuals over time was unknown. A longitudinal study led by researchers at the University of British Columbia, St. Michael's Hospital in Toronto, and the University of Ottawa and funded by the Canadian Institutes of Health Research, aims to address the gaps in the research.

"While there have been other studies that look at the health of homeless and vulnerably housed people, this is the first study that looks at changes in the health and housing status of these populations over time," says Evie Gogosis, one of the study's three research coordinators. The Health and Housing in Transition [HHiT] study is tracking a cohort of homeless and vulnerably housed single adults and looking at changes to their health and housing status over a two-year period.

Researchers and community partners from the PHS Community Services Society in Vancouver, Street Health in Toronto, and Ottawa Inner City Health, Inc., began the study in 2009 by recruiting 200 homeless people and 200 vulnerably housed people in each of the three cities. Participants were recruited from shelters, meal programs, community health centres, drop-in centres, rooming houses, and single room occupancy (SRO) hotels. Those considered "vulnerably housed" had to have their own residence, but had experienced a period of homelessness and/or two or more moves in the previous 12 months.

The team gathered baseline data through in-person interviews that explored participants' demographics, housing status, health status, health-care use, substance use, quality of life, food security, and social supports. The next step was to keep track of these individuals and conduct follow-up interviews in 2010-2011; a second follow-up will be completed in 2011-2012.

Collecting the data is no mean feat. "A major challenge of the HHiT study is locating participants over time," says Gogosis. "Many live in unstable housing and transition from being homeless to vulnerably housed, which can make it difficult to find them for follow-up." Another challenge is to ensure that study sites use the exact same methodology and adhere to the same selection criteria, to ensure consistency in the data.

At present, the team has completed its analysis of the baseline data, which provides new insights on the health of homeless and vulnerably housed Canadians. One finding is that both homeless and vulnerably housed people had spent a considerable amount of time being homeless

(about three years) over their lifetimes. Many reported being unable to access health care and had visited the emergency department or been hospitalized in the previous year—a strategy that is likely more costly to the system, while providing none of the benefits of preventive or regular health care. Detailed objective information on participants' health care use will be obtained through linkage with provincial health care administrative databases.

Comparing the homeless and vulnerably housed, Gogosis says, "These populations are much more similar than different. The most surprising finding in the baseline data is that being vulnerably housed had the same effect on mental and physical health as being homeless does."

Stress, occasional bouts of homelessness and lack of access to medical care may be factors in this correlation, but the team expects to better understand them after the follow-up interviews are complete. "We have to look at the incidence of housing transitions among these populations—how many exit homelessness, and how many become stably housed, and then look at how these transitions affect a person's health." Ultimately, the team hopes to be able to establish a solid basis for understanding the link between changes in a person's housing situation and changes in physical and mental health. ■

For more information, contact Evie Gogosis, Research Coordinator, Centre for Research on Inner City Health, Keenan Research Centre in the Li Ka Shing Knowledge Institute of St. Michael's Hospital, at gogosis@smh.ca.



A Benchmark for Research into the Canadian Homeless Population

Data from the Homeless Individuals and Families Information System (HIFIS) is beginning to shed light on the shelter-using homeless population and establish a benchmark for future research.

Supported by the Homelessness Partnering Secretariat at Human Resources and Skills Development Canada, HIFIS is used by a growing network of shelters across the country to record the gender and age of shelter clients, along with their entry and exit dates. To develop a profile of the country's homeless population, Dr. Aaron Segart, HIFIS Analyst and Senior Researcher with the Secretariat, launched the National Shelter Study, using HIFIS data gathered since 2005, along with similar information from the City of Toronto.

Canada's 397 emergency shelters feature 15,000 beds; the study shows that their client base has remained stable at approximately 150,000 individuals from 2005 to 2009. The average age of a shelter user is 37 years, with roughly three-quarters of them male; the average shelter stay was 16 days. The data also reveals details about some of the shelter demographics—for example, that the average length of stay for families was 50.2 days in 2009, versus 13.9 days for single adults, and that the gender gap among shelter users increases with age.

Dr. Segart does not hesitate to point out some of the limitations of the study, which depends on ensuring uniform data entry from HIFIS software installed in many diverse locations and services across the country. "The shelters are primarily interested in running their programs, rather than generating a data set for us, so we put a lot of effort into verifying it," he says. "They're always under pressure, so we're grateful to those who participate." However, as more shelters participate every year, the level of confidence in the data continues to increase (see figure). Mathematical modelling also corrects for some of the missing data.

Other limitations may also be cast as opportunities for future research. "It would be great to go into other demographics, such as education, ethnicity, disabilities, mental-health issues, and so on, but we just don't have data yet," says Dr. Segart. Likewise, not enough transitional housing and violence-against-women [VAW] shelters use HIFIS for the data to be meaningful at this point—but he hopes that will change.

The study nevertheless sets a baseline and helps to confirm the validity of the HIFIS model, as many of the findings were consistent with the US Annual Homelessness Assessment Report to Congress,

and with anecdotal reports—for example, people working in shelters have observed that clients are staying longer in shelters and that family homelessness is up.

Year	Unique Individuals	95% Confidence Interval	
2005	156,030	142,804	169,256
2006	150,663	138,015	163,312
2007	146,884	134,177	159,591
2008	151,621	137,265	165,977
2009	146,726	134,224	159,229

Total number of unique individuals using emergency shelters in Canada

These trends in particular should be the subject of more detailed examination, Dr. Segart notes. "While there are certainly fewer adults at emergency shelters, we're missing transitional housing data, and we're wondering if the advent of Housing First programs is putting more of the largest segment of the homeless population, single individuals, directly into transitional housing." Casting a wider net with the HIFIS data might help to establish some correlations between shelter use and other factors, such as the recent recession and a lack of affordable housing; similarly, gathering more information about client characteristics, such as mental health issues, might help researchers better understand the effectiveness of programs offered by service providers.

Another aspect of the homeless population that Dr. Segart would like to explore is the typology of shelter clients—for example, those who use a shelter once during a crisis might be very different from chronically homeless people—and learning about them might help service providers adapt to their clientele.

The National Shelter Study continues to gather HIFIS data, and the aggregate information will be useful to service providers and policymakers alike; meanwhile, researchers may find much to build on, says Dr. Segart: "One of the immediate benefits of this study is that it helps us ask better research questions." ■

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Family Reconnect: a Path for Youth to Return from Homelessness?

"We were surprised by the percentage of young, homeless people who wanted to reconcile at some level with family—but we hadn't seen that as a priority in the research literature in Canada," says Dr. Daphne Winland, Associate Professor at York University and one of the co-authors of *Family Matters: Homeless Youth and Eva's Initiatives' "Family Reconnect" Program*. Another co-author, Dr. Stephen Gaetz, also at York and Director of the Canadian Homelessness Research Network (CHRN), observes that the same gap exists on the ground: "We have created a system that focuses on emergency services—and it's not that they're doing a bad job, but the longer a young person remains unhoused, the more entrenched they become in the street lifestyle, and the harder it is for them to move forward in their lives."

Interested in how a more preventive, family-centred approach might help homeless youth, they profiled the Family Reconnect Program spearheaded by Eva's Initiatives, a Toronto-based group, to determine the effectiveness of the approach, and what elements of it could be replicated on a larger scale.

From 2009 to 2010, the two researchers, along with their research assistants, Tara Patton and Melissa Atkinson-Graham, interviewed staff of the Family Reconnect program to get a solid understanding of how the program works; they also interviewed program clients—both youth and family members—about personal and family histories, the circumstances that led the youth to the streets, their experience of homelessness and their involvement in the program. Finally, they analyzed client data gathered by Eva's Initiatives over the previous five years, comprising information about more than 1,000 individuals.

The analysis showed that the Family Reconnect model, which focuses on counselling for youth and family, diagnosis and mental-health supports, encouraged many young people to renew contact with family and demonstrably improved relations between them. The program was also able to better identify underlying mental-health issues, which in turn can bring the right supports into play.

With recommendations at the municipal, provincial and federal level, the report is a guide for agencies and governments across the country on what they'll need to make their youth-homelessness strategy more family-centred and more proactive.



It also makes a forceful case for the cost-effectiveness of the approach: while Family Reconnect spent \$7,125 for each of the 32 young people it helped to return home or into more stable housing, keeping them in a shelter runs in excess of \$20,000 per year. This does not include other costs that Dr. Gaetz says only escalate if left unchecked: "The longer a person is homeless, the more likely their physical and mental health deteriorates meaning their use of health services increases, or that they'll become involved in the criminal justice system—both very expensive."

Replication or adaptation of the program in other municipalities will depend on both the policy context and the scale, as many smaller urban centres are less focused on youth and homelessness. Whatever the local situation, he notes, "this kind of program is probably more effective when it is incorporated more broadly at a system's level, not an agency one, because every agency needs to be involved"—for example, to facilitate prevention and to ensure that any time a young person enters the shelter system, he or she receives an assessment and intervention to either help him or her move back home or into independent living (with supports).

A family-centred approach will also have to take into account a realistic notion of what constitutes a family, says Dr. Winland: "There's such a focus on nuclear families, in terms of who can step in—yet we saw many cases of people from different cultural backgrounds, where the relations young people had developed might be an aunt or a more distant relative."

For the future, the research team hopes to use its findings to promote dialogue, and possibly to engage in a broader study of the issue of youth and homelessness, which would allow them to analyze different sub-sets of the youth population that may have different experiences, perspectives and needs. ■

The *Family Matters* report is published on the Homeless Hub website at www.homelesshub.ca/ResourceFiles/FamilyMatters_April2011.pdf. For more information, contact Dr. Stephen Gaetz at 416-736-2100, ext. 20050 or sgaetz@edu.yorku.ca or consult the Eva's Initiatives website at www.evasinitiatives.com.

A New Perspective on Crime, Victimization and Young Homeless People

"The conventional wisdom is that street kids are criminals or are involved in crime," says Dr. William O'Grady of the University of Guelph—but an extensive 2009 study of Toronto street youth, led by Dr. O'Grady and Dr. Stephen Gaetz of York University, shows that people who leave their homes at an early age are much more likely to be the victims of crime.

The research team conducted interviews with 244 homeless young people in Toronto, locating participants through shelters and drop-in centres that provide services to them. The team first distributed a self-administered survey, and followed up with face-to-face, tape-recorded interviews that went into detail about the participants' life on the streets, and especially their experiences of victimization.

The findings paint a stark picture: more than 76 per cent reported at least one instance of criminal victimization over the previous 12 months, with 63.6 per cent reporting a violent crime. "A lot of these people had been victimized, and traumatized—and some were very open, about the lack of support, that they were angry at the police," says Dr. O'Grady. More disturbingly, he adds, "some mentioned not bothering to contact police if they were victimized, because they might get in more trouble."

The team also investigated several gender aspects of youth homelessness and violence. "The prevalence of partner violence that young women experienced was much higher compared to young women who are housed," says Dr. Gaetz. "Also, young women in general were more likely to experience violence on the streets than young men—whereas in the general population males are more likely than females to experience violence." He notes that young women would also seek out partners for companionship and as a kind of defence against the street life but, in some cases, these relationships too involved abuse.

One of the most significant findings of the study is a strong correlation between levels of victimization and the age at which a young person becomes homeless. "This is an effect that persists through their street 'career'," says Dr. O'Grady.

"They may build up experience on the street, but they have no protection, and they're much more likely to be entrenched in street life: drugs, crime, the rougher side of the street."

The report directs several recommendations. Of these, Dr. Gaetz emphasizes that "the need for a strategic response for homelessness is paramount. If we want to make them safer, we need to do what we can to make sure they don't remain homeless." Dr. O'Grady concurs, noting that "in the homeless-service network, organizations tend to work on their own. So, some services are replicated while others are absent; some could easily refer clients to others if they

knew of their existence.

It's basically an emergency response to homelessness we have now, and there's not enough effort to make these services better organized."

Dr. Gaetz also emphasizes the need for more resources targeted to young women, both preventive and in the emergency sector. "Most street services are now co-gender, but young women on the street have often already faced abuse," he says, "so being in a co-gendered environment is not always helpful."



The single most cost-effective change, Dr. O'Grady suggests, would be to keep shelters open on a 24-hour basis: "That's not as expensive as you'd expect. It's been done in the States and it didn't lead to a big change in expenses, because the resources were already there." He also notes that young people often had interactions with police while waiting to get into a shelter. "Letting them in is much less expensive than police intervention," he says. The team expects to continue working with the data they have to produce another report that explores the factors that predict interactions between street youth and the police. ■

For more information, contact Dr. O'Grady at 519-824-4120, ext. 58943 or wograd@uoguelph.ca, or Dr. Stephen Gaetz at 416-736-2100, ext. 20050 or sgaetz@edu.yorku.ca, or download the *Surviving Crime and Violence* report, available at www.homelesshub.com.

Involving Women Facing Homelessness in the Agencies that Serve Them

Several research projects carried out over the past five years—such as *Count Us In! Inclusion and Homeless Women in Downtown East Toronto* and *Coming Together: Homeless Women, Housing, and Social Support*—have brought forward recommendations about the services needed by women facing homelessness. These studies used a feminist participatory research model, involving women who had experienced homelessness as decision-makers in their design and implementation.

And that model gave weight to another emerging theme: “There was a focus on how women were treated by the organizations that served them,” says Emily Paradis, Research Associate at the University of Toronto’s Cities Centre. “Making services more democratic upholds the dignity and rights of women who access those services. It’s not enough to tell them that their employees need sensitivity training; the women who have experienced homelessness should be involved.” Paradis adds that these agencies can gain a lot from the strengths, skills and knowledge of women who have experienced homelessness.

The studies’ findings were strong enough to warrant further exploration: the Cities Centre, along with the Ontario Women’s

Health Network and FORWARD, an advocacy group, received funding from Human Resources and Skills Development Canada’s Homelessness Knowledge Development Program to document some of the most promising practices in services for women facing homelessness. Under the project banner of “We’re not Asking, We’re Telling”, the research team conducted an inventory of innovative practices in local, Canadian and international services, conducted interviews with service managers and staff across southern Ontario and held meetings and focus groups with women and families to share and document good practices they employ to survive homelessness, find housing and rebuild their lives.

The team aimed to be as inclusive as possible in carrying out the research—and all but one of the project’s researchers had experienced homelessness at some time, while an advisory board included representatives of both service agencies and self-advocacy groups. Spanning both academic and advocacy worlds had its challenges, however: “On the one hand, there was a challenge in reframing the practical work within academic limitations, such as the University’s requirement for an ethical review,” says Paradis. “On the other, was the challenge for academics of shifting out of the pure research into action, which is a lot messier—but that’s a good thing.”

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Despite these challenges, the study identified a host of practices that will have practical application for service providers and the homeless women they serve and involve in their services. A few examples:

- There are several ways to encourage input from women, ranging from suggestion boxes to exit interviews and town hall meetings, and they should be acted on promptly if they are to be seen as effective.
- Agencies can show that they value lived experience by hiring women who face homelessness, and promote involvement through mentorship programs and peer education programs.
- Women can be included in program governance through designated seats on a board of directors, for example, or through advisory committees.

Several debates emerged along with the findings. For example, while there was widespread admiration for the intent of the Housing First approach, many participants felt that it translated into pushing women and children back into unaffordable, inadequate housing in the private market. Another debate involved the degree to which services should care for women, as opposed to promoting self-reliance and the building of support networks.

This echoes a similar dichotomy in how women perceive the service staff they interface with, says Paradis: "Some homeless women want only to talk to someone who's been there, while others say they want to talk to someone who has the training and education." Above all, she says, it's important to consider the women's individual needs and avoid simple explanations.

With the report on the study recently published, the team plans a variety of workshops and presentations to share its findings and promote the discussions that have already emerged. As Paradis puts it, "Part of this project was to identify good practices, but it's also to document a wave of change that's moving through services right now, toward a more participatory model that engages service users directly in governance, and the design and delivery of services." ■

A report on the study is published on the Homeless Hub at www.homelesshub.ca. For more information, contact Emily Paradis at e.paradis@utoronto.ca.



Housing Conditions in Canadian Mid-Sized Urban Centres

Recent analysis of 2006 Census data suggests that the rate of housing need in many Canadian mid-sized urban centres is lower than in large metropolises. The analysis, detailed in a new Research Highlight, profiles Census Agglomerations (CAs)—or urban centres with an urban core population of over 10,000 and having a total population smaller than a Census Metropolitan Area (CMA)—and examines data for the 111 CAs reported in the 2006 Census.

In all, about 14 per cent of Canada's households lived in CAs in 2006 (1.7 million out of 12.4 million), down slightly from 2001 (1.8 million). Between 2001 and 2006, there were CA boundary changes and reclassifications: six large CAs grew to become Census Metropolitan Areas (CMAs); two centres lost enough population that they could no longer be classified as CAs; and seven communities grew enough to become CAs during that time. "This affects the calculations of CA household growth between 2001 and 2006," says CMHC Senior Researcher Willa Rea, who conducted the analysis. "To compare household counts for the two years, you could simply look at the number of CA households in each year. If one adjusts for these boundary changes, however, there was a slight *increase* in CA households in the same locations (from 1.6 million in 2001)."

	All	Owner	Renter
Canada	12.7%	6.3%	27.2%
CAs	10.6%	4.4%	25.0%
Highest growth 25 CAs	9.3%	4.3%	20.8%
Medium growth CAs	11.2%	4.5%	26.5%
Lowest growth or declining 25 CAs	10.5%	4.2%	26.9%

Percentage of CA households in core housing need by tenure and by household growth, 2006

The analysis also reveals that core housing need in CAs in 2006 was 10.6 per cent, which is lower than both the Canadian average of 12.7 per cent and the CMA average of 13.6 per cent. Affordability remained the largest factor in core housing need, overall and for owners and renters separately—yet average shelter-to-income ratios in CAs were below the national average (20.6 per cent against 21.8 per cent).

These figures mask significant differences between the fastest-growing and other CAs. "To me, the most interesting finding is that core housing need in 2006 was lower for the highest-growth CAs," says Rea. She notes that many of the CAs with the highest growth rates were in Alberta, where there was a vibrant job market in 2006; proximity to CMAs such as Toronto, Montréal and Vancouver could also have been a factor. In contrast, many of the lower-growth CAs were located in areas that depend heavily on the exploitation of natural resources.

"You might think that in high-growth areas, if rents are high, then the incidence of core housing need would also be high. But if incomes keep pace with rents, then the overall incidence of housing need may be similar to or even lower than in other areas where there is less growth and rents are lower," Rea says. "Still, low-income households would obviously have a harder time if shelter costs were rising."

She also states that the findings should be taken in the context of the household conditions of Canada as a whole, and CMAs in particular, and that they will be of special interest to policymakers and housing providers in mid-sized urban centres. "My intention was to showcase the data," she says, "but researchers might be interested in digging deeper in their respective communities, depending on where they are." ■

A Research Highlight published by CMHC (#67316) provides further detail of the analysis of housing conditions of CAs, including data on individual CAs, and breakdowns by size and growth rate. Another Research Highlight (#66634) offers similar analysis of data for CMAs. For more information, please contact Willa Rea at wrea@cmhc.ca or 613-748-2300, ext. 3454.

Housing in the Mid-Northern Region of Quebec

Housing is one of the core components of Plan Nord, the Government of Quebec's overall approach to sustainable development above the 49th parallel. The plan explicitly recognizes that economic development may depend on, and ultimately affect, the housing market and availability; it also recognizes the specific housing challenges facing Aboriginal communities, and sets out commitments to building affordable housing units that will benefit both the Aboriginal and non-Aboriginal populations.

In support of the definition of the housing needs in the context of Plan Nord, the housing situation in the Kativik (far northern) region had been well documented in recent years, thanks to 2006 Census and local public housing administration data as well as a review of the literature. Quebec's Mid-Northern Region (Secteur Moyen-Nord, which spans from 49° to 55° North). The Société d'habitation du Québec (SHQ) had produced a profile with 2001 Québec Mid-Northern Region Census data. SHQ then updated the area's housing and household profile, using 2006 Census data, to create a more comprehensive profile.

Census data describes the region as having a population of 111,254 inhabitants—concentrated in four communities of more than 5,000 people (Baie-Comeau, Sept-Îles, Port-Cartier and Chibougamau), 28 smaller communities and, 26 additional communities with Aboriginal majorities (including eight reservations). Band housing in the Aboriginal communities in particular had rarely been studied in Quebec—and affordability data was still not available for them.

The study, authored by the SHQ's Claudine Roy, found that housing situations in the mid-northern region differ from those in the rest of the province in several important ways:

- Largely because of jobs in the mining and forestry sectors, household incomes were relatively high, while housing was generally more affordable than the Quebec average, leading to a higher ownership rate in the region, at 66.5 per cent (compared to the 60.1-per-cent Quebec average), and reaching 80 per cent in small communities. The rate in Aboriginal communities is 21.4 per cent.

	Population	Number of households	Owned (%)	Rented (%)	Band housing (%)
Quebec total	7,886,108	3,189,340	60.1	39.8	0.1
Mid-northern region total	111,254	43,185	66.5	28.3	5.2
Towns (5,000+)	62,389	26,555	68.1	31.8	-
Small communities	29,524	12,030	80.2	19.6	0.2
Aboriginal communities	19,341	4,600	21.4	30.5	48.5

Source: Statistics Canada, 2006 Census, product #97-554-XCB2006020. The Quebec population total is an April 2010 Statistics Canada postcensal estimate.

Homeownership rates in the Mid-Northern Region of Quebec, 2006

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- Dwellings in the region tended to have more rooms than the Quebec average, possibly because of low costs, for both owners and renters, compared to Quebec as a whole.
- The housing stock was in poorer condition, according to the residents' own answers to the relevant 2006 Census question; the situation was even more pronounced in Aboriginal communities.

The profile also highlights some key characteristics that set Aboriginal households apart: Aboriginal households are larger than the average for the region and for Quebec as a whole—though this does not necessarily translate into larger housing size, so these households may experience more overcrowding. Homeownership rates are also lower than non-Aboriginal households and lower than the Quebec average, especially in smaller communities. Band housing in the Region's Aboriginal communities is almost equal to owned and rental types combined. And while the average age of principal household supporters was roughly comparable in the region to that of Quebec, Aboriginal households tended to be younger. In the Region's Aboriginal communities, with 51.5 per cent of principal household

supporters were between 25 and 44 years old, as opposed to only 36.5 per cent for the region's communities of more than 5,000 people, 33.8 per cent for the region's small communities and 34.5 per cent for the province.

The findings of research will be of interest to housing builders and providers in the region—as well as to industries that wish to attract more workers as Plan Nord unfolds. While the housing overall remains affordable, the housing stock remains a concern, most particularly among the Aboriginal population. The SHQ hopes to improve its knowledge and to highlight the evolution of housing conditions in all northern areas with the 2011 National Household Survey of Statistics Canada. ■

For more information, contact Dany Dutil, Head of Research and Evaluation at the SHQ's Planning, Research and Development Directorate, at 514-873-8775, ext. 3023, or dany.dutil@shq.gouv.qc.ca, or download the full report, *Portrait des ménages et du logement dans le secteur Moyen-Nord du Plan Nord du Gouvernement du Québec* [French only], at www.habitation.gouv.qc.ca/publications/fiches_fr/M2095601.html. More information on Plan Nord is available at <http://plannord.gouv.qc.ca/english/index.asp>.

