

Research article

How small is too small? Assessing the wellbeing impacts of nano suites on university students

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Abstract

As cities densify and more residents move into smaller apartments, there are questions about the wellbeing impacts of living in tiny spaces. To understand the wellbeing impacts of tiny living, we surveyed residents of new nano suites (140 ft² or 13 m²) built for students at a Canadian university. Using a pre-post survey design, we measured the changes to social and subjective wellbeing, environmental attitudes and future housing expectations. After seven months living in a nano flat, we found no negative impacts on subjective and social wellbeing. We also found that tiny living may change expectations about where residents would like to live in the future, making them more open to the idea of living in an apartment instead of a single family detached home. This is particularly relevant in cities and regions where the expectation of living in a single family detached home serves as a barrier to densification and sustainable land use planning. Overall residents were highly satisfied with the nano suite and were motivated to live there because of its affordability. A prolonged housing affordability crisis may make tiny units increasingly a part of the housing mix in the city of the future. Our results are specific to young adults in a university environment and how these results may apply for residents in other conditions or life stages remains an open question.

Keywords: Environmental concern, housing expectations, social connections, tiny homes, nano flats, wellbeing.

Introduction

The pressure for more affordable housing is forcing planners, architects and real estate developers to design for smaller housing units in the form of very small apartments, tiny homes or nano flats (Ford & Gomez-Lanier, 2017; Ng, 2021; Wong, 2018). Hong Kong has led the way with the iconic one room nano flats that occupy only 214 ft² (20 m²). Between 2018 and 2020, Hong Kong built over 600 nano flats per year (Wong, 2018) and more recent estimates suggest that over 2,000 nano flats were added to the housing stock in 2020 alone, comprising over 12 per cent of all new dwellings (Ng, 2021). As the

most unaffordable city in the world, and without legislation for minimum space requirements, Hong Kong is pushing the boundaries of small living.

Yet interest in small living is far reaching and has captured the attention of residents in North America and Australia where the average home sizes are some of the largest in the world (Carlin, 2014; Pinsker, 2019; Saxton, 2019). The last few decades have seen the rise of the tiny home movement (Ford & Gomez-Lanier, 2017), and the establishment of the Small House Society (est. 2002) who advocate on behalf of small homeowners and promote the simple lifestyle that comes with tiny homes (Anson, 2014). Advocates claim that new generations of young adults and retirees are attracted to tiny living, the minimalist lifestyle that it provides, the freedom and additional disposable income available when not burdened with high housing costs (Carlin, 2014; Shearer & Burton, 2019). Tiny homes are also gaining relevance as the average household size shrinks (Brokenshire, 2018; Wulff et al., 2004). In their critique of tiny living, Harris & Nowicki (2020) argue that micro units are marketed as innovative and unique but ignore problematic implications such as compromising minimum living standards. Other critique focuses on the capitalist aspirations of developers to maximize profits at the expense of suitable and safe homes. The authors argue that micro living is being normalized or reframed as a desirable housing option, which is coincidentally, highly profitable for developers, without providing a liveable solution to address the housing crisis and an extremely unaffordable housing market (Harris & Nowicki, 2020).

In this article we draw from the literature on both tiny homes, which are detached homes that may be either moveable or permanent (Shearer & Burton, 2019), as well as nano flats¹ which are situated in multifamily buildings (Cheng, 2020). While tiny homes and nano flats have emerged from very different urban contexts, market pressures and ideologies, they share similar motivations for their construction (affordability, urban densification), as well as potential benefits (reduced environmental footprint). Regulators and critics of small living also have concerns that excessively small units may generate negative health and wellbeing impacts on residents (Cheng, 2020; Evans, 2022; Hanckmann, 2019).

While tiny homes are more common in North America and Australia, countries in Asia and Europe have turned to nano flats for their potential to address affordability challenges and social housing emergencies. Some European cities have reduced minimum housing standards in order to facilitate the introduction of nano flats. For example, in December 2020 the regional government of Catalonia (Spain) reduced the minimum home size from 36m² to 24m² to allow for the construction of nano flats (Angulo, 2020). This move was meant to facilitate innovative co-housing arrangements and to allow for architectural designs that would reduce personal living space in exchange for shared common spaces (Cabré & Andrés, 2018; Eliason, 2014).

Similarly, Israel has recommended a reduction in the minimum dwelling size² (Israel Planning Administration, 2020). The central government regulates minimum dwelling size through minimum room requirements, which if added, amount to 25m² (269ft²). However, local governments have the authority to deviate from the minimum dwelling size regulation.³ Observers argue that there is a market for small dwellings and an unmet demand for small apartments designed for 1-3 person households (Friedler, 2014). While the Israel Planning Administration promotes the construction of small dwellings, these efforts have not yet succeeded, and only a fraction of newly constructed housing is small.

Discussions about tiny homes and nano flats share many features, especially with regard to the underlying fears and concerns that regulators have about widespread adoption (Antoninetti, 2008; Evans, 2018; Ford, 2001). Fear of change to the neighbourhood character may partially motivate resistance against tiny living

(Antoninetti, 2008; Evans, 2022, 2018). Moreover, building codes and land use zoning regulations remain barriers that have slowed its implementation. Other accounts refer to minimum dwelling sizes as hard fought legislation that protects residents from sub-standard conditions (Barrows, 1983). Thus, the contemporary emergence of tiny living is viewed as regressive: housing policy may take steps backwards and fail to protect the vulnerable. Indeed, critics argue that tiny living is the next chapter in the capitalist push to exploit the landless, poor, and marginalized, and that tiny living infringes on fundamental rights to housing (Cheng, 2020).

Conversely, proponents of tiny living highlight its affordability and potential to reduce our collective environmental footprint (Evans, 2018; Shearer et al., 2018; Shearer & Burton, 2019; Wong, 2018). This alignment between financial and environmental interests has been critical for the movement to gain such widespread attention (Penfold et al., 2018). Proponents for small living see it as an antidote to numerous housing issues including temporary housing, housing for the homeless, urban densification, and short-term rentals for tourists (Ford & Gomez-Lanier, 2017; Mingoya, 2015).

Yet academic research on this topic is limited and many claims in favour and against tiny living have received limited scrutiny. While much has been written about tiny living in the grey literature, on blogs, and in social media (Penfold et al., 2018), the academic literature remains thin, with only a few exceptions (Boeckermann et al., 2019; Ford & Gomez-Lanier, 2017; Mangold & Zschau, 2019; Saxton, 2019). There is particularly little written about the impacts of tiny living on behaviours and perceptions, nor have we seen systematic analyses studying how the experience of tiny living might make a lasting imprint on our social lives, our health, our environmental consciousness or our attitudes toward housing.

This research examines the impacts of tiny living on our wellbeing, our social connections, environmental attitudes, and future housing expectations. In particular, we ask: (1) How might living in tiny homes impact subjective and social wellbeing? (2) Does living in nano flats affect environmental consciousness? (3) Does the experience of living in nano flats impact housing preferences and expectations? We study these questions using a pre-post research design with students at the University of British Columbia (UBC) who lived in new 140ft² (13m²) nano suites for seven months. We found no negative impacts on social and subjective wellbeing, even though the follow-up survey was administered in the early phase of the Covid-19 pandemic, and unexpected reductions in environmental concern. We also found that tiny living may change expectations about where students believe they will live in the future and make them more open to the idea of living in an apartment instead of a single family detached home.

In the next section we review the literature on tiny living. We discuss the motivations for choosing a tiny living lifestyle, including the affordability and environmental benefits. Additional dimensions of tiny living and its potential impact on wellbeing and housing preferences are reviewed.

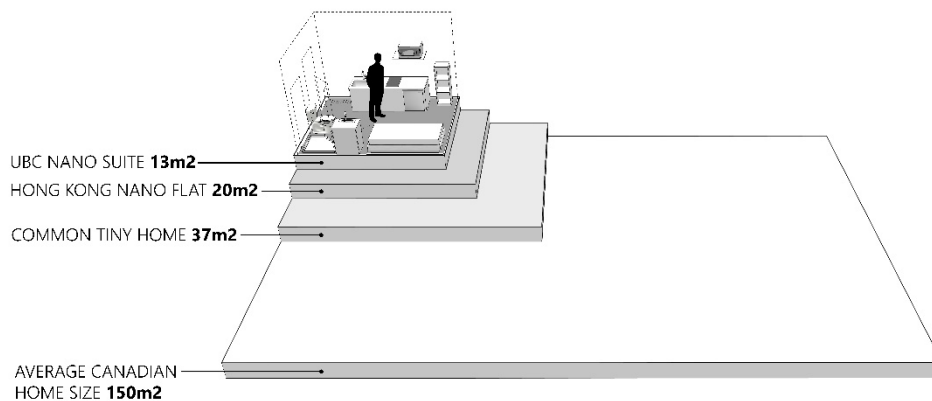
Literature review

Tiny homes vary in cost, size, tenure, location, building materials, legal status and design but are typically considered under 300ft² (28m²) (Kilman and Colledge, 2016) or under 430ft² (40m²) (Shearer & Burton, 2019). Tiny homes are efficiently designed spaces that enable affordability, environmentally conscious lifestyle, freedom to move (for mobile structures), sense of community and involvement in the design process (Boeckermann et al., 2019; Saxton, 2019). Saxton (2019) provides a review of the definitions of small living and Shearer & Burton (2019) provide a typology of tiny homes differentiated by

mobility and dwelling type. Our study focuses on nano flats, units smaller than 214ft² (20m²) (Wong, 2018). Ultimately, these are efficient, small spaces and include sufficient space to sleep, bathe, store, and cook (Kilman & College, 2016; Shearer & Burton, 2019).

For many, the sizes of tiny homes are difficult to conceptualize, and it is valuable to compare surface areas (Figure 1). The UBC nano suite examined in our study is smaller than the typical nano flat in Hong Kong, although it is not the smallest known living space in cities. Munich University in Germany offered student housing of 7m² (75ft²) (Scally, 2006) and a private firm in Europe had proposed renting sleeping pods of only 3m² (32ft²) for 200 Euros a month (Pareja, 2018). The firm has already deployed these units in Hong Kong and Japan for the student market, however this proposal was dismissed by regulators in Europe for not meeting minimum housing requirements (Pareja, 2018). Compact accommodation forms originated in the iconic Japanese capsule hotels which offer comfortable sleeping pods (as large as a single bed) for low rates since 1979 (De Castro, 2018). These later inspired micro hotels in global expensive cities such as New York, London, and Paris that offer increasingly appealing accommodations ranging from 30 to 300ft² (or 3 to 28m²) (Levere, 2019).

Figure 1: A comparison of a conventional home with the various sizes of tiny homes and nano flats. The nano suites at the University of British Columbia are smaller than even some of the smallest known living spaces, such as the notorious nano flats in Hong Kong



Contemporary discussions about tiny living raise old questions in a new context. How small is too small? What is the smallest size unit in which one can still maintain quality of life? What is the impact of living in smaller units on our social life, our happiness and our life satisfaction? Is tiny living suitable for everyone? And might the experience of living in smaller units change our environmental attitude and behaviour? Or might the experience of living in a small unit change residents' expectations about where they will live in the future? In the literature review that follows, we review the trade-offs associated with tiny living.

Affordability

Small homes are more affordable to build, buy, and live in (Eliason, 2014), although some question this assumption, showing that the costs per square foot are higher for tiny homes (Cheng, 2020; Shearer, 2019). Smaller dwelling size can offer a significant reduction in housing costs, if nothing else for maintenance and utilities and reduced consumption due to limited space (Carlin, 2014). Because developers can fit more units on a given plot, these projects may assist developers with their goals to maximize profits

(Nowicki et al., 2022). However, there are other costs related to regulatory challenges or insurance that may not apply to conventional homes (Hutchinson, 2016; Saxton, 2019). For example, most banks will not offer standard construction loans or home mortgages, forcing buyers to accrue substantial equity before building (Anson, 2014; Brokenshire, 2018). In Hong Kong, regulatory requirements make mortgages for nano flats unaffordable to first-home buyers. Developers then offer loans in a second-hand market, which also requires homeowners to have significant down payments (Cheng, 2020). Unlike tiny homes, nano flats are built within an established legal and financial framework, removing some of the aforementioned financial, legal or zoning barriers.

Wellbeing

Despite the potential advantages of tiny living, there remain outstanding concerns with regard to the wellbeing impacts on residents (Hanckmann, 2019). Minimum lot and building size requirements are established precisely with the intent of protecting the welfare of residents and under the assumption that excessively small units will have negative impacts on quality of life and wellbeing. Subjective wellbeing refers to how people think and feel about their lives, such as their emotional state, or life satisfaction. Research has shown that subjective wellbeing is correlated with physical and mental health and longevity and it is strongly affected by one's network of positive social relations (Diener & Chan, 2011; Diener et al., 2018; Sandstrom & Dunn, 2014). It is well established that positive social relationships are powerful predictors of human health and wellbeing (Helliwell & Putnam, 2012; Holt-Lunstad et al., 2010). This has motivated urban planners and designers to consider how built form and design may contribute to a healthier and happier city (Montgomery, 2013).

Social isolation, community detachment and loneliness are major threats to the wellbeing of urban residents and have been identified as particularly relevant in Canadian cities (Rios et al., 2017). In 2012, residents in Vancouver ranked social isolation among their highest concerns, even more than housing affordability (Vancouver Foundation, 2012). Observers have raised concerns about the impact of nano-residents involvement with their local community, speculating that residents of nano-apartments are less committed to the local communities than the other residents because they only plan to reside there temporarily (Cheng, 2020). Harris & Nowicki (2020) further reinforce this notion by pointing to average tenancy lengths in projects offering micro units.

On the other hand, it is suggested that social engagement may be a motive to living tiny in the first place. Tiny home dwellers seek the common spaces interaction, participate in social activities, and share resources and skills. Because indoor space is limited, social activities move outdoors (Hanckmann, 2019; Shearer & Burton, 2019; Willoughby et al., 2020). This requires a careful design of common spaces to make them accessible, attractive, and available (Hutchinson, 2016). Moreover, less home maintenance translates into more disposable time to socialize (Hutchinson, 2016; Shearer & Burton, 2019; Willoughby et al., 2020) which, in turn, facilitates a sense of relief and happiness (Carlin, 2014). Therefore, the extent to which living in very small spaces may contribute to social connectivity, sense of community, friendships, life satisfaction and other wellbeing indicators is unclear. While we might expect heterogeneous impacts based on age, gender and other factors (Diener et al., 2018), there remains little research on the wellbeing impacts of tiny living.

Loneliness and social isolation are common in the first few months after starting university. The transition time between one's home and a new environment can often trigger mental health challenges. Student housing, social networks and support systems are therefore given attention in research (Alves, 2023; Worsley et al., 2021). Student accommodation's physical characteristics (e.g.: natural light, opportunities to interact

and to socialize, proximity to nature, and furniture choice) are particularly important because of the time spent in them. Importantly, these need to be designed to be more than just “a place to sleep”. Other important factors influencing mental, emotional and physical health include the number of roommates, quality of social connections, quality of the common areas, and the presence of affordable, on-site support staff aimed at providing psychological and mental health services to support those who struggle (Alves, 2023; Worsley et al., 2021). Finally, having the option to choose the particular unit is shown to increase happiness (The Class Foundation, 2023).

Environmental concern

Living in larger homes is associated with more material consumption and energy use (Bogin et al., 2022; Shearer & Burton, 2019). Research from Australia shows that larger homes are more likely to have larger greenhouse gas emissions (Fuller & Treloar, 2004). Other studies have also shown a strong positive correlation between home floor area and average annual electricity consumption (McLoughlin et al., 2012; Saxton, 2019; Yohanis et al., 2008). Living in small residences may also be motivated by environmental consciousness and a desire to reduce our environmental footprint (Shearer & Burton, 2019; Willoughby et al., 2020). Tiny homes have indeed demonstrated reduced environmental impact compared to conventional houses (Carlin, 2014) but are still a niche market.

Tiny living may also change our consumption patterns (Sandberg, 2017). One tiny home resident noted that most tiny house dwellers find that living in a small space encourages them to consider carefully before making a purchase. After all, there’s not much room, so buying another possession often means letting go of an older one (Murphy, 2014). However, few studies investigate environmental-related and behavioural changes following a move to a tiny home (Sandberg, 2017). Saxton’s (2019) study demonstrates that nano lived experience has the power to change many aspects of one’s lifestyle including reduced consumption patterns, recycling, eating habits (more locally, more environmentally conscious). Moreover, she finds a significant reduction in ecological footprints of 80 American downsizers: from an average ecological footprint of 7.0 global hectares (gha) prior to moving to a nano suite to 3.9 gha following their move.⁴

At the same time, there are also environmental impacts associated with tiny living. Living tiny may increase dining in restaurants (kitchen is small), less recycling (smaller storage space limits the possibility to buy bulk and produces more packaging), and increase energy use due to building materials and the need to regulate temperature (the latter is mainly relevant to tiny homes on wheels). Tiny homes located on the trailer of a vehicle may also produce more driving and those promoted as ‘luxury-in-nature’ could potentially have an adverse impact by promoting households to move into rural areas (Penfold et al., 2018). Unplanned tiny homes that are scattered over the landscape or built as small clusters might not consider existing urban fabric density and thus compromise amenity- and resource-resiliency (Alexander et al., 2019). However, Saxton (2019) identified over 100 patterns of behaviour with a positive contribution to environmental impact which outweighed the negative instances by roughly six to one. Some of these negative environmental impacts are unique to tiny homes and are not necessarily relevant to nano flats.

Housing preferences

Demand for housing is shaped by household housing preferences. Housing choice research tries to identify and measure the competing priorities and trade-offs that inform the decision process (Ahluwalia, 1999; Bina & Kockelman, 2009; Hinshaw & Allott,

1972). It is well-known that housing constitutes more than the physical structure itself - it includes a bundle of attributes such as neighbourhood characteristics, safety, green space availability, quality of schools, neighbourliness and access to services (Bina & Kockelman, 2009; Clark et al., 2006; Hinshaw & Allott, 1972). Moreover, research shows that housing preferences and demand for housing are constrained by the alternatives available (Marsh & Gibb, 2011; Shlay, 1985).

Advocates of tiny living point out that smaller housing units may enhance urban diversity and help address a wider range of housing preferences. Tiny homes enable diversity at the building scale which may support diversity across a range of dimensions such as income, race, gender, household size and lifestyle. The creation of place diversity, including social and economic diversity of people and functions in space is a valued best practice in urban planning (Arigoni, 2001). Diverse housing types may also support aging in place. Arguments in favour of creating place diversity as a normative objective in planning policy include vitality of a place, economic health, social capital, and social resilience (Talen, 2006).

Saxton (2019) narrows nano flats resident categorization into two main groups, namely millennials under 30 and retirees of 50 years and up. They are described as “adaptable, flexible urban citizens” (Harris & Nowicki, 2020). These demographics are described in the literature as those choosing the unique tiny home lifestyle (Boeckermann et al., 2019). The tiny house lifestyle, Mangold & Zschau (2019) suggest, ‘offers a much more individualistic, pragmatic, and experience-driven road to finding happiness.’ Tiny home residents are said to adopt this lifestyle to achieve the ‘Good Life’ or increase life satisfaction (Mangold & Zschau, 2019). This entails decreasing environmental footprint, pursuing personal freedom, adventures spirit, artistic inclination or counterculture advocacy (Evans, 2018). Or perhaps they are only advertised in such a way to adhere to neoliberal aspirations? (Nowicki et al., 2022).

However, developers have often shunned building housing types without a proven track record of selling and tend to be more interested in reproducing housing forms that have low risk and higher profit margins (Leinberger, 2008; Morrow-Jones et al., 2004). There are also claims that many housing markets prefer lower density housing types (Audirac & Shermeyen, 1994; Hinshaw & Allott, 1972; Howley, 2009), even though these claims are in dispute (Nelson, 2012). In this context, it becomes valuable to understand the future demand for various housing types. Might the experience of living in a nano flat change future housing preference and make those residents more open to the idea of living in apartments instead of single family detached homes? It is conceivable that the emergence of tiny living may shape demand and open future opportunities to build tinier.

Method

Study site

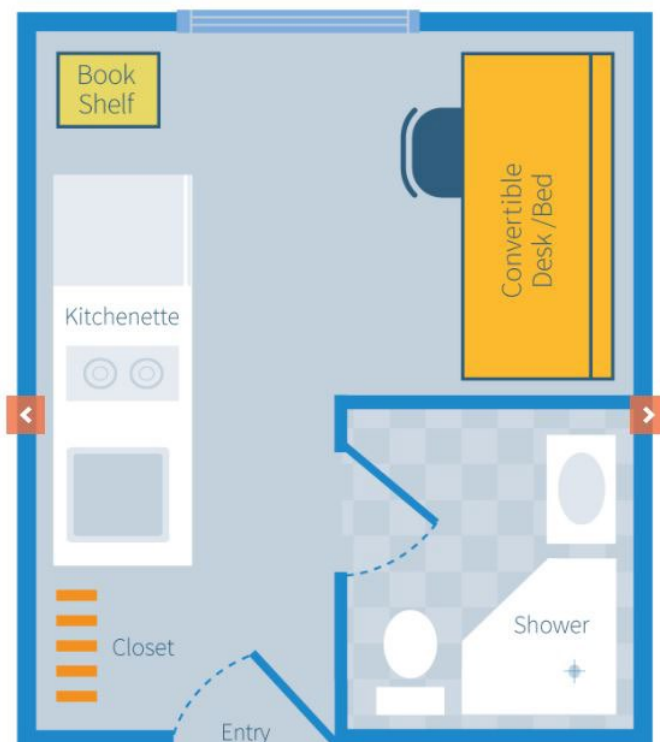
Vancouver, Canada is one of the least affordable cities in the global North (Cox & Pavletich, 2017; Gurstein & Hutton, 2020). Housing affordability is high on the political agenda, pushing city managers to find new and creative ways to meet the housing needs of Vancouver residents (City of Vancouver, 2019). The housing pressures in the region have adversely affected the students and faculty at UBC, by extending commute times and reducing time spent on campus.

UBC’s nano suites project is part of the university’s broader effort to develop affordable housing for the UBC community as articulated in the Housing Action Plan. The university aims to respond to the diverse housing needs and demands of students in

different life stages by expanding the number, types and sizes of housing units available (Campus and Community Planning, 2018).

Nano suites designed by DIALOG (<https://www.dialogdesign.ca/>), are part of the UBC year-round (May-April), on-campus, housing inventory and are allocated based on date of application. The nano suites are fully independent personal space (Figure 2) including a convertible desk/bed, a private bathroom, a kitchenette, and a closet. The nanos are part of a bigger complex, namely the Exchange residence (hosting a total of 651 beds—mainly upper-year and graduate students), including a mix of unit types. Similar to other on-campus housing options, the Exchange includes nano suites, studios, 1-bed units, shared apartments, and townhouses where a typical rate for a room is between \$776 for a nano suite and 1,594 for a 1-large bedroom per month (2023/24 fees). An average rent for a bachelor and a 1-bedroom apartment in Vancouver as of October 2022 is \$1,378 and \$1,543, respectively (CMHC, 2024). Internet and utilities are included in the Exchange residence fees. The Exchange units are complemented with indoor common spaces at no additional cost for all residents with the goal of promoting a healthy, liveable community. The shared spaces provide opportunities to study and socialize and include lounges, games room, fitness area and other shared spaces spread over different parts of the building. The nano suites are strategically located at the centre of campus, above the central transit hub, and within short walking distance to the Aquatic Centre, Student Recreation Centre, academic buildings, the student building, and a selection of restaurants and cafes. Our research studied the first cohort of nano suite residents as they moved into the new units in the fall of 2019.

Figure 2: Floorplan of the nano-suite unit at the University of British Columbia, consisting of 140ft² or 13m²



Source: University of British Columbia

Survey design

We administered two online surveys (pre-post) to nano suite residents in collaboration with the Student Housing and Community Services (SHCS) to measure the satisfaction with the living experience, subjective wellbeing, social wellbeing, environmental attitudes, and housing preferences and expectations. The first survey was distributed soon after move-in (1-19 October 2019) while the second was circulated towards the end of the contract (28 April-27 May 2020). A link to the survey was e-mailed by SHCS to all 71 nano suite contract holders. We offered \$30 to those who completed each survey (\$60 for both). The amount was put on their student cards and could be used to purchase items in a selection of food services on campus. The recruitment e-mail included an introduction to the study and research team, potential contribution of respondent inputs, completion time, data privacy information, and a link to the online survey. One- and two-week- reminder e-mails were sent to those who did not respond to the first message.

The first survey included 35 questions and the follow-up survey included 45 questions.⁵ Both surveys consisted of eight sections: (1) motivation for entering a nano suite; (2) expected satisfaction/satisfaction with the nano suite; (3) whether they would recommend to others (only included in the follow-up survey); (4) life satisfaction (subjective wellbeing); (5) social connections; (6) environmental concern; (7) expectations about future living conditions; and (8) demographic information.⁶

Respondents were asked to indicate what motivated their nano suite choice. The following reasons were included in the survey (multiple choice was optional): *Lower financial cost of housing; To reduce my environmental footprint; It fits my minimalist lifestyle; I was curious; It just seemed cool; Smaller spaces require less cleaning; and I did not want to live in a shared suite with roommates.* In addition, respondents were asked to rate [their] expected satisfaction/satisfaction with the following [12] aspects of [their] current housing on a seven-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (7): *Affordability; Size of the suite; Layout/design of the suite; Safety and security; Quality of the housing; Privacy; Quietness; Living without flat-mates; Interactions with other students; Overall quality of [the] housing experience; Cleanliness of the facilities/common areas; and Amenities provided.*

To measure subjective wellbeing, we used a five-item scale which was validated across varied studies to measure life satisfaction, namely the Satisfaction With Life Scale (SWL) (Pavot & Diener, 1993). The instrument asks individuals for an overall assessment of their life conditions in order to estimate the concept of life satisfaction (Diener et al., 1985). The SWL includes the following questions: *In most ways my life is close to my ideal; The conditions of my life are excellent; I am satisfied with my life; So far I have gotten the important things I want in life; and If I could live my life over, I would change almost nothing.* A seven-point Likert scale is provided ranging from 'strongly disagree' (1) to 'strongly agree' (7) (Pavot, 2018). Subjective wellbeing measures are shown to be the most accurate if estimated in a direct reference to the actual experience (Kahneman and Krueger, 2006), in our case, living in a nano suite.

The five social connection questions were adopted from the *My Health My Community Survey* (myhealthmycommunity.org), designed based on well-established sources, such as the Canadian Community Health Survey, Canadian Health Measures Survey, and National Census. Minor adaptations were made to match the study's specific context. The questions were presented as follows: *How many really close friends do you have? That is, someone in your network that you could confide in, tell your problems to, or call when you need help (Close.friends); How many people would you count among your wider network of friends with whom you maintain a personal relationship? That is, someone who provides either socio-emotional, instrumental or informational support.*

These can include neighbors, acquaintances, etc. (Wide.network); I find myself alone more often than I would like (Find.alone); How would you describe your sense of belonging to your local community? (SOB); and In the past 12 months have you done any volunteer work for university or any other organization or group? (Volunteer.Yes).

Three general environmental concern questions were developed based on similar studies to explain how an underlying worldview affects behaviour or attitude. In particular we used statements from the New Ecological Paradigm (NEP) scale (Dunlap, 2008). The scale estimated the nature of human-environment interactions and reflected environmental-related attitudes, beliefs, and behavioural intentions (Stern et al., 1995). The NEP scale is used in pre-post studies to assess intervention or activity such as educational programs on environmental values (Anderson, 2012). It has been widely used in research, was revised over time, and was subject to methodological scrutiny (Anderson, 2012; Dunlap, 2008; Stern et al., 1995). Because we wanted to include a behavioural aspect, the third environmental-related question addressed consumer decisions after introducing the Ecologically Responsible Lifestyle (ERL) concept.⁷ This was selected in light of criticism of the NEP scale being an inaccurate predictor of environmental behaviour (Dunlap, 2008). The three following questions were presented along with a seven-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (7): *The earth is like a spaceship with only limited room and resources (Earth.limited); I am willing to consume less and go without some comforts if it helps to protect the environment (Consumption); and In recent years there has been considerable debate over efforts to minimize environmental degradation by pursuing ECOLOGICALLY RESPONSIBLE LIFESTYLE. Where would you locate yourself on the following scale regarding these efforts in relations to your consumer decisions? (ERL).*

The seventh survey section used a stated preference approach to examine tenure expectations, and future living conditions preferences and ideals. Accordingly, preferences were based on household ranking of hypothetical housing alternatives (i.e. apartment/condominium vs. single detached house) (Coolen & Hoekstra, 2001; Earnhart, 2001; Timmermans et al., 1994). Respondents were asked to respond to the following questions using a seven-point Likert scale ranging from 'strongly disagree' (1) to 'strongly agree' (7): *I expect to own a home in the future (Expect.to.own); My ideal future living arrangement would be to live in a single detached home (SDH.ideal); My ideal future living arrangement would be to live in an apartment or condominium (Apart.ideal); I would prefer to live in a single detached home instead of an apartment or condominium (SDH.prefer); and I would prefer to live in an apartment or a condominium instead of a single detached home (Apartment.preference).*

Finally, the demographic questions referred to gender, origin (domestic or international), program type (full or part time), program start date, and employment status.

The follow-up survey asked for qualitative feedback about the overall experience living in a nano suite. Response to all questions was optional so that one could complete the survey even if they chose not to answer a specific question. The surveys took approximately seven and ten minutes to complete and UBC ethics approval was obtained prior to distribution (H19-01979).

Results

We obtained a 92 per cent response rate (n= 64) in the pre-survey and a 77 per cent response rate (n= 55) in the post-survey. Descriptive statistics of the samples and motivation are in Table 1. Female respondents represent 59 per cent of the total responses in the first survey and 64 per cent in the follow-up survey. Roughly half of respondents are Canadian whereas the others are international students (we did not

collect information on country of origin). All respondents in both surveys were registered in a full-time program. The majority of respondents were upper-year students: 70 per cent in the first survey and 75 per cent in the follow-up survey started their program in 2017. Roughly 40 per cent were employed part-time. The lower unit cost and the independent living space were the most significant motivators for choosing the nano suite accommodation (50 per cent and 36 per cent of respondents rated these factors, respectively). Curiosity and the suggestion that the nano suite is ‘cool’ were not rated by any of the survey respondents. Only three per cent referred to the units’ environmental impact and the fact that the nanos demanded less cleaning as motivational factors in their housing decision. Finally, a minimalist lifestyle also seems to be of little impact on resident housing choice (with seven per cent of respondents checking this motivational factor).

Table 1: Descriptive statistics of nano suite residents and motivation to apply for a nano suite

	<i>Pre</i>		<i>Post</i>	
	n=64	%	n=55	%
Demographics				
Gender (Female)	36	59	34	64
Origin (Domestic)	32	54	27	51
Student status (Full time)	60	100	52	100
Program start date (2017)	42	70	39	75
Employment status (Part time)	24	40	19	37
Volunteer	46	73	33	60
Motivation			NA	NA
<i>Lower financial cost of housing</i>	62	50		
<i>To reduce my environmental footprint</i>	4	3		
<i>It fits my minimalist lifestyle</i>	9	7		
<i>I was curious</i>	0	0		
<i>It just seemed cool</i>	0	0		
<i>Smaller spaces require less cleaning</i>	4	3		
<i>I did not want to live in a shared suite with roommates</i>	44	36		

Wellbeing

We found no statistically significant reduction at a 95 per cent confidence level (pre-post) in subjective wellbeing or in social wellbeing after living in the nano suite for seven months (Table 2). Summary of the Satisfaction with Life responses generated a composite subjective wellbeing measure ranging from 2.2 (min) to 6.8 (max) (mean=4.71, sd=1.15) in the first survey and from 1.2 (min) to 5.36 (max) (mean=4.69, sd=1.24) in the follow up survey.

Table 2: Full results – two sample t-test assuming unequal variances

	Pre				Post				Test statistics			
	Mean	sd	Min/Max	N	Mean	sd	Min/Max	N	df	t stat	T Critical	p-value
Subjective Well Being	4.71	1.15	2.2/6.8	61	4.69	1.24	1.2/5.36	53	107	0.12	1.98	0.90
Social Well Being												
<i>Close.friends</i>	3.14	0.73	2/5*	64	3.13	0.75	2/5	55	114	0.10	1.66	0.46
<i>Wide.network</i>	2.95	0.74	2/5**	64	3.09	0.75	2/5	55	114	-1.00	1.66	0.16
<i>Find.alone</i>	3.77	1.57	1/6	64	3.87	1.60	1/7	55	114	-0.37	1.66	0.36
<i>SOB</i>	4.36	1.46	1/6	64	4.44	1.24	1/7	55	117	-0.31	1.66	0.38
Environmental concern												
<i>Earth.limited</i>	5.72	1.32	1/7	64	5.29	1.32	2/7	55	114	1.77	1.66	0.04
<i>Consumption</i>	5.63	1.17	2/7	64	5.56	1.05	2/7	55	117	0.30	1.66	0.76
<i>ERL</i>	5.48	1.22	1/7	64	4.93	1.14	2/7	55	116	2.58	1.66	0.01
Future living expectations												
<i>Expect.to.own</i>	5.86	1.28	1/7	64	5.87	1.30	1/7	54	112	-0.05	1.98	0.96
<i>SDH.ideal</i>	5.08	1.51	2/7	63	5.09	1.44	1/7	55	115	-0.04	1.98	0.97
<i>Apartment.ideal</i>	4.39	1.74	1/7	64	4.84	1.54	1/7	55	117	-1.48	1.98	0.14
<i>SDH.preference</i>	4.73	1.73	1/7	64	4.56	1.66	1/7	55	115	0.55	1.98	0.58
<i>Apartment.preference</i>	3.77	1.77	1/7	64	3.96	1.63	1/7	55	116	-0.63	1.98	0.53

Notes: *Close.friends* scale: '1'-"None", '2'-"1 to 2", '3'-"3 to 4", '4'-"5 to 8", '5'-"More than 8".

Wide.network scale: '1'-"None", '2'-"1 to 7", '3'-"8 to 19", '4'-"20 to 30", '5'-"More than 30".

Environmental concern

We found that students' environmental concern is different (*lower*) on average post nano living experience (Table 2). The two sample t-test assuming unequal variances provided evidence to reject the null hypothesis in favour of an alternate hypothesis in two out of the three environmental concern questions, namely: 'The earth is like a spaceship with only limited room and resources', and the ERL question.

Results were statistically significant at a 95 per cent confidence level for the '*The earth is like a spaceship with only limited room and resources*' and ERL questions but not for the *Consumption* question (Table 2.). The '*Earth.limited*' mean score decreased from 5.72 in the pre survey (min=1, max=7) to 5.29 (min=2, max=7) in the post survey (sd=1.32 in both surveys; p-value=0.04) on a scale between 1-'Strongly disagree' and 7-'Strongly agree'. *ERL* mean score decreased from 5.48 in the pre survey (min=1, max=7) to 4.93 (min=2, max=7) in the post survey (sd=1.22, 1.14, respectively; p-value=0.01) on a scale between 1-'Strongly disagree' and 7-'Strongly agree'.

Interestingly, the qualitative responses⁸ indicate awareness of consumption patterns and environmental concern. For example, when describing the advantages of living in a nano suite, one resident wrote, *It's small and compact - it really makes you realize what belongings you don't need, and it helps you to declutter*. When describing the disadvantages, another student noted: *Not a lot of space for extra stuff...* and another: *Limited space, cannot have too many stuff....* Responses to 'Other important considerations' included a student who wrote: *Really take the time to consider what you are thinking of bringing with you to live in this space - if you think there are purchases to be made, wait until after you move in*.

Housing preferences and expectations

Of the five questions on housing preferences and expectations, we found the largest pre-post shift on the question pertaining to apartments as an ideal future living arrangement (Figure 3). After having lived in nano suites, we find that residents were more open to the idea of living in an apartment in the future. Results of the Fisher's Exact test show that for the question 'My ideal future living arrangement would be to live in an apartment or condominium' the p-value is 0.01906 and below the threshold 0.05 (Table 3). The other questions pertaining to housing preferences and expectations presented some shifts in favour of denser living, however these differences were not statistically significant at a 95 per cent confidence level (Table 3).

Figure 3: A comparison of responses to the agree/disagree statement: My ideal future living arrangement would be to live in an apartment or condominium before and after having lived in the nano suite. Following the experience of living in a nano suite, residents were less likely to disagree with the possibility of living in an apartment in the future

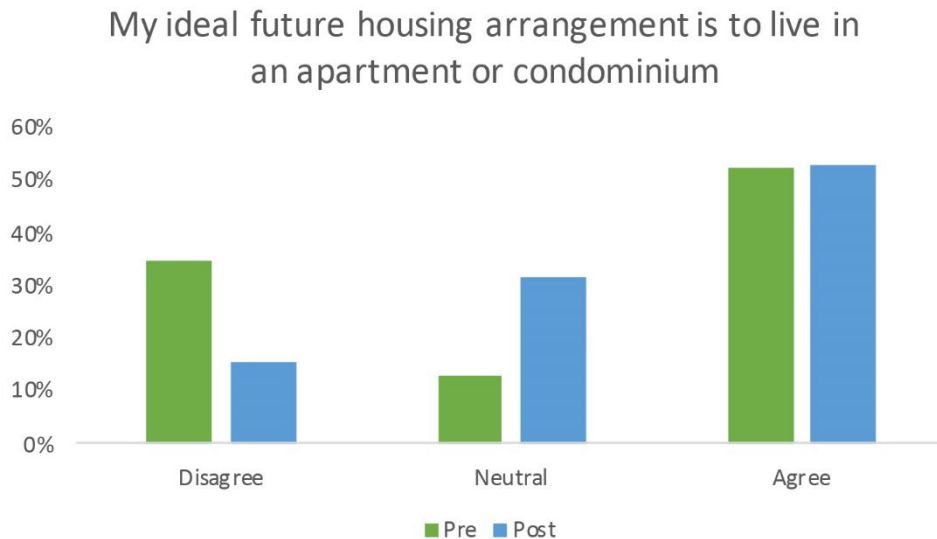


Table 3: Full results – Fisher’s Exact test

Future living expectations	X-squared	df	p-value
<i>Expect to own</i>	1.21	2	0.61
<i>SDH ideal</i>	0.21	2	0.93
<i>Apartment ideal</i>	7.92	2	0.02
<i>SDH preference</i>	0.02	2	1
<i>Apartment preference</i>	3.19	2	0.21

Discussion

Our work makes several contributions to the literature on housing policy, tiny living and nano flats. First, we provide the first pre-post comparison of nano suite residents in North America, which allows us to test common hypotheses posited by advocates of tiny living. In our context, overall satisfaction with tiny living is high, even when absolute space is extraordinarily small, shattering conventional standards and minimum requirements by a considerable margin for most cities. Other factors appear to compensate for the small size, such as location, affordability, and privacy. The particular life-stage of these residents, as young university students, is likely to explain the high value given to location and affordability over living space. Therefore, our finding underscores how the wellbeing impact of particular housing conditions is sensitive to context. Nevertheless, we illustrate that planners can design for healthy living even with extremely reduced personal living space. Our work reiterates what has been shown elsewhere, in that housing satisfaction depends on conditions outside the home and context beyond the physical dimensions of the unit itself. Our results are specific to young adults in a university environment, where

living in the nano suits is temporary. Moreover, the student accommodation is complemented with quality indoor common spaces at no additional cost. The shared spaces provide opportunities to study and socialize which surely impact student satisfaction and wellbeing. How these results may apply for residents in other conditions or life stages remains an open question.

It is also notable that subjective wellbeing remained stable even in the face of a global pandemic (the follow up survey took place in April 2020). The pandemic could have affected overall satisfaction and happiness (Kahneman & Krueger, 2006), especially given the stay at home measures which forced nano flat residents to remain in tiny living spaces (Honey-Rosés et al., 2020). One might expect that the pandemic would have led to reductions in self-reported wellbeing, however we find that wellbeing measures were stable in the pre-post comparison (Table 2). On the other hand, the nano living might have been perceived as safer by students compared to living with roommates. Student access to services and an integration of on-site counselling, health services and stress-related workshops promote student wellbeing (Alves, 2023). Because Counsellors in Residence is an available option on UBC student accommodation, it is fair to assume that these services contributed to students in challenging times and had a positive impact on their subjective wellbeing.

We found little evidence that tiny living led to greater environmental awareness, but we did find qualitative reflections on consumption patterns in the open-ended response segment of our survey. Environmental concerns were clearly not the reason why residents chose this lifestyle (Table 1). Sustainable design of the Exchange accommodation was carefully considered by the architecture firm. This includes the residence location near the transit exchange, bike spaces, energy reduction measures, building materials, natural daylight and exposure to views, recycling stations located throughout the residences and common spaces, central waste sorting rooms, and water efficiency. However, this did not seem to positively impact respondents' environmental awareness. This is supported by Sandberg (2017) who found a lack of environmental framing around downsizing or Mangold & Zschau (2019) who suggest that issues of sustainability are not among the primary motivations for living tiny rather the individualistic, pragmatic view of simple living. This appears to contradict the mainstream narrative on tiny homes that suggest that these residents are motivated by environmental consciousness or a desire to reduce our environmental footprint (Shearer & Burton, 2019; Willoughby et al., 2020) but here as well, the particular life stage can explain this result. Furthermore, the qualitative feedback suggests that residents of nano suites are aware of the impact that a tiny living space has on their consumer behaviour. Perhaps there exists an opportunity to raise student awareness to environmental issues and how it is directly linked with their housing choice. Even if environmental awareness is not a key factor in choosing the nano flat house type (or tiny home for that matter), it is important to note that these have indeed demonstrated reduced environmental impact compared to conventional houses (Carlin, 2014).

Our results indicate that the experience of living in a nano suite made residents more open to the possibility of living in an apartment in the future. This is particularly important in unaffordable housing markets such as Vancouver, where there are debates about residential densification or upzoning (Honey-Rosés & Zapata, 2021). It is conceivable that the emergence of tiny living may shape demand and open future opportunities to build tinier. Nano flats have appeared in Tel Aviv, where housing demand is high and housing unaffordability is severe. However, these nano flats are mostly illegal subdivided units for rent, and like Hong Kong these subdivided units rarely meet essential safety requirements (Cheng, 2020; Cheung & Jim, 2019; Wong, 2018). Our results encourage further exploration to the possibility of expanding housing supply, and the supporting regulatory framework, in high demand locations to include tiny residences without

necessarily compromising resident subjective and social wellbeing. The nano suite's central location on the university campus, and its accessibility to nearby services, is likely to contribute to student satisfaction and high self-reported subjective and social wellbeing. Therefore our findings highlight the intimate relationship between private space and public space, whereby high quality public space, and public amenities may compensate for living in small spaces (Brown, 2011; Hutchinson, 2016). In the words of Ben Brown (2011), *the smaller the nest, the bigger the balancing need for community*.

Some limitations of our analysis should be acknowledged. The Fisher's Exact test used in this study requires the assumption of pre-post sample independence. While we were able to pair some of the pre-post responses, some nano suite residents responded to only one of the two surveys. Moreover, the Fisher's Exact test does not measure the magnitude of the change rather the directionality of responses. Also, we are uncertain if the non-response rate might be correlated with specific characteristics of respondents. On the other hand, since the response rate was exceptionally high in both surveys (92 per cent and 77 per cent), we do not expect that the attrition had a meaningful influence on our results.

Future research could further explore how life stage circumstances relate to satisfaction with tiny housing and overall wellbeing. It is plausible, although not certain, that our results on subjective wellbeing may be extended to individuals in later life stages. Answering this question would be valuable, especially as the average household size decreases due to lifestyle choices, fewer children, and divorce (Brokenshire, 2018). Within the university context, future research could explore how the nano experience might have stronger synergies with the development of a stronger environmental ethic. If environmental awareness is found to affect later housing-related decisions, the construction of such units might have a large effect on housing markets and help advance the sustainability agenda. Finally, densification efforts that include nano flats, could potentially address the needs of individuals who seek to live in high demand locations. A prolonged housing affordability crisis may make tiny homes increasingly a part of the housing mix in the city of the future. In such a future, it is incumbent on researchers, city designers and architects to understand the wellbeing implications of living in tiny spaces.

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Notes

1. Also referred to here as "nano suites" as this terminology is used by the University of British Columbia, where the study took place.

p. 17. How small is too small? Assessing the well-being impacts of nano suites on university students

2. Israel Planning and Construction Regulations (2013) define a small dwelling as one between 30-80 m² (323-861 ft²).
3. The Tel Aviv-Yafo Local Planning Committee's Planning and Design Guide (2015) specifies 35 m² (376 ft²) as the gross minimum residential unit requirement.
4. The national averaged footprint in the United States is 8.4 gha.
5. The follow-up survey included questions about whether residents will recommend to others to choose the nano suite accommodation option and at which price points, an additional environmental attitude question, and three open-ended questions to estimate the overall nano living experience. Otherwise, both surveys were similar.
6. For the survey's Supporting Information including the questionnaire please contact the corresponding author.
7. That is, choosing to act in a way that is better for the environment, for example: driving less and walking more, consuming less energy, buying recycled products, and eating locally grown vegetables.
8. For the full survey results please contact the corresponding author.

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References

- Ahluwalia, G. (1999). Public attitudes toward growth. *Housing Economics* 47, 7-12.
- Alexander, S., Gleeson, B., Coupe, T., Matyevich, N., Scott, R., & Schultz, F. (2019). Bumps Along the Road of the Tiny House Movement: Practitioner Notes with Critical Reflections. *Australian Planner*, 55, 198-208.
- Alves, T. (2023, June 9). Bridging the Gap: Enhancing Student Wellbeing through Collaborative Accommodation and Student Services. *LinkedIn*. <https://www.linkedin.com/pulse/bridging-gap-enhancing-student-wellbeing-through-services-alves/>
- Anderson, M.W. (2012). *New Ecological Paradigm (NEP) Scale*.
- Angulo, S. (2020). *El govern dona llum verda als minipisos amb espais compartits*. La Vanguard.
- Anson, A. (2014). "The world is my backyard": Romanticization, Thoreauvian Rhetoric, and Constructive Confrontation in the Tiny House Movement. *Research in Urban Sociology*, 14, 289-313. <https://doi.org/10.1108/S1047-004220140000014013>
- Antoninetti, M. (2008). The Difficult History of Ancillary Units: The Obstacles and Potential Opportunities to Increase the Heterogeneity of Neighborhoods and the Flexibility of Households in the United States. *Journal of Housing for the Elderly*, 22, 348-375. <https://doi.org/10.1080/02763890802458320>
- Arigoni, D. (2001). *Affordable Housing and Smart Growth: Making the connection*. Washington, D.C.
- Audirac, I., & Shermyen, A.H. (1994). An Evaluation of Neotraditional Design's Social Prescription: Postmodern Placebo or Remedy for Suburban Malaise? *Journal of Planning*

Education and Research, 13, 161-173. <https://doi.org/10.1177/0739456X9401300301>

Barrows, R.G. (1983). Barrows Beyond the Tenement: Patterns of American Urban Housing, 1870-1930. *Journal of Urban History*, 9(4), 395-420.

Bina, M., & Kockelman, K.M. (2009). Location Choice vis-à-vis Transportation: The Case of Recent Homebuyers. In R. Kitamura, & T. Yoshoo (Eds.), *The Expanding Sphere of Travel Behaviour Research* (pp. 597-619). Emerald Group Publishing.

Boeckermann, L.M., Kaczynski, A.T., & King, S.B. (2019). Dreaming Big and Living Small: Examining Motivations and Satisfaction in Tiny House Living. *Journal of Housing and the Built Environment*, 34, 61-71.

Bogin, D., Kissinger, M., & Erell, E. (2022). In Israel as Well, People are Energy Consumerists Not Buildings: An Analysis of Different Lifestyle Impact on Households Energy Consumption Patterns and the Potential Reduction in GHG Emissions. *Ecology and Environment*, 13(3), 57-66.

Brokenshire, S. (2018). Tiny Houses Desirable or Disruptive? *Australian Planner*. 55, 226-231.

Brown, B. (2011). Livin' Large in Small Spaces: It Takes a Town. *Place Makers*. <http://www.placemakers.com/2011/01/14/livin-large-in-small-spaces-it-takes-a-town/>

Cabré, E., & Andrés, A. (2018). La Borda: a case study on the implementation of cooperative housing in Catalonia. *International Journal of Housing Policy*, 18, 412-432.

Campus and Community Planning (2018). *The University Community on Campus: UBC's Housing Action Plan*.

Carlin, T.M. (2014). *Tiny homes: Improving Carbon Footprint and the American Lifestyle on a Large Scale* (No. 35). Celebrating Scholarship & Creativity Day 35.

Cheng, K.Y. (2020) Nano-apartments: The Synergy of Rights, Choice, Markets, and Regulations? In B. Yung, K.P. Yu (Eds.), *Land and Housing Controversies in Hong Kong: Perspectives of Justice and Social Values* (pp. 29-39). Springer.

Cheung, P.K., & Jim, C.Y. (2019). Indoor Air Quality in Substandard Housing in Hong Kong. *Sustainable Cities and Society*, 48. <https://doi.org/10.1016/j.scs.2019.101583>

City of Vancouver (2019). *Housing Vancouver Strategy: Annual Progress Report and Data Book 2019*. Vancouver, Canada: City of Vancouver. <https://vancouver.ca/files/cov/2019-housing-vancouver-annual-progress-report-and-data-book.pdf>

Clark, W., Deurloo, M., & Dieleman, F. (2006). Residential Mobility and Neighbourhood Outcomes. *Housing Studies*, 21, 323-342. <https://doi.org/10.1080/02673030600585946>

CMHC (2024). Rental Market Report. Ontario, Canada: Canada Mortgage and Housing Corporation. <https://www.cmhc-schl.gc.ca/professionals/housing-markets-data-and-research/market-reports/rental-market-reports-major-centres>

Coolen, H., & Hoekstra, J. (2001). Values as determinants of preferences for housing attributes. *Journal of Housing and the Built Environment*, 16, 285-306. <https://doi.org/10.1023/A:1012587323814>

Cox, W., & Pavletich, H. (2017). *13th Annual Demographia International Demographia International Housing Affordability Survey: 2017*.

De Castro, M. (2018). Here's What It Feels Like To Stay In A Japanese Capsule Hotel. Travel. *Travelers Today*.

Diener, E., & Chan, M.Y. (2011). Happy People Live Longer: Subjective Well-Being Contributes to Health and Longevity. *Applied Psychology: Health and Well-Being*, 3, 1-43. <https://doi.org/10.1111/j.1758-0854.2010.01045.x>

Diener, E., Emmons, R.A., Larsen, R.J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of Personality Assessment*, 49, 71-75.

Diener, E., Lucas, R.E., & Oishi, S. (2018). Advances and Open Questions in the Science of Subjective Well-Being. *Collabra Psychology*, 4, 15.

Dunlap, R. (2008). The New Environmental Paradigm Scale: From Marginality to Worldwide Use. *The Journal of Environmental Education*, 40(1), 3-18. <https://doi.org/10.3200/JOEE.40.1.3-18>

Earnhart, D. (2001). Combining Revealed and Stated Preference Methods to Value Environmental Amenities at Residential Locations. *Land Economics*, 77(1), 12-29. <https://doi.org/10.2307/3146977>

Eliason, M. (2014). Baugruppen: To Form a More Affordable Urbanism [WWW Document]. *The Urbanist*. <https://www.theurbanist.org/2014/05/20/baugruppen-to-form-a-more-affordable-urbanism/>

Evans, K. (2022). An examination of perceptions and preferences for tiny house villages for the homeless in Missouri. *International Journal of Housing Policy*, 23(3). <https://doi.org/10.1080/19491247.2022.2072661>

Evans, K. (2018). Overcoming Barriers to Tiny and Small Home Urban Integration: A Comparative Case Study in the Carolinas. *Journal of Planning Education and Research*, 41(3), 1-12.

Ford, J., & Gomez-Lanier, L. (2017). Are Tiny Homes Here to Stay? A Review of Literature on the Tiny House Movement. *Family and Consumer Sciences Research Journal*, 45(4), 394-405. <https://doi.org/10.1111/fcsr.12205>

Ford, L.R. (2001). Alleys and Urban Form: Testing the Tenets of New Urbanism. *Urban Geography*, 22(3), 268-286. <https://doi.org/10.2747/0272-3638.22.3.268>

Friedler, L. (2014). *Small Dwellings in the Israeli Housing Market*. Jerusalem, Israel: Milken Innovation Center.

Fuller, R.J., & Treloar, G.J. (2004). *The Influence of Housing Size, Style and Location on Energy and Greenhouse Gas Emissions*. Perth.

Gurstein, P., & Hutton, T. (2020). *Planning on the Edge: Vancouver and the Challenges of Reconciliation, Social Justice and Sustainable Development*. Vancouver, Canada: UBC Press.

Hanckmann, H. (2019). *Downsizing to Upgrade your Life*. University of Twente.

Harris, E., & Nowicki, M. (2020). "GET SMALLER"? Emerging geographies of micro-living. *Royal Geographical Society with IBG*, 52(3). <https://doi.org/10.1111/area.12625>

Helliwell, J.F., & Putnam, R.D. (2012). The social context of well-being. In F.A. Huppert, Baylis, N. and Keeverne, B. (Eds.). *The Science of Well-Being* (pp. 435-459). Oxford, UK: Oxford University Press. <https://doi.org/10.1093/acprof:oso/9780198567523.003.0017>

Hinshaw, M., & Allott, K. (1972). Environmental Preferences of Future Housing Consumers. *Journal of the American Institute of Planners*, 38(2), 102-107. <https://doi.org/10.1080/01944367208977411>

Holt-Lunstad, J., Smith, T.B., & Layton, J.B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, 7(7). <https://doi.org/10.1371/journal.pmed.1000316>

Honey-Rosés, J., Anguelovski, I., Chireh, V.K., Daher, C., Konijnendijk van den Bosch, C., Litt, J.S., Mawani, V., McCall, M.K., Orellana, A., Oscilowicz, E., Sánchez, U., Senbel, M., Tan, X., Villagomez, E., Zapata, O., & Nieuwenhuijsen, M.J. (2020). The impact of COVID-19 on public space: an early review of the emerging questions – design, perceptions and inequities. *Cities & Health*, 5(2), S263-S279. <https://doi.org/10.1080/23748834.2020.1780074>

Honey-Rosés, J., & Zapata, O. (2021). The Impact of Residential Densification on Perceptions of Public Space. *Journal of the American Planning Association*, 87(2), 282-295. <https://doi.org/10.1080/01944363.2020.1846597>

Howley, P. (2009). Attitudes towards compact city living: Towards a greater understanding of residential behaviour. *Land Use Policy*, 26(3), 792–798. <https://doi.org/10.1016/j.landusepol.2008.10.004>

Hutchinson, D. (2016). *Struggling for Spatial Authenticity: An Analysis of the Tiny House Movement*. University of Colorado Denver.

Israel Planning and Construction Regulations (2013). *Definition of Residential Program and Small Dwelling according to Section 147(b)* (temporary regulation) (in Hebrew).

Kahneman, D., & Krueger, A.B. (2006). Developments in the Measurement of Subjective Well-Being. *Journal of Economic Perspectives*, 20(1), 3-24.

Kilman, C., & College, C. (2016). Small House, Big Impact: The Effect of Tiny Houses on Community and Environment. *Undergraduate Journal of Humanistic Studies*, 2, 1–12.

Leinberger, C.B. (2008). *The Option of Urbanism: Investing in a New American Dream*. Washington, DC: Island Press.

Levere, J.L. (2019). *The Microhotel, a Category Seeing a Growth Spurt, Makes Small Stylish*. New York Times.

Mangold, S., & Zschau, T. (2019). In Search of the “Good Life”: The Appeal of the Tiny House Lifestyle in the USA. *Social Sciences*, 8(1), 1–21.

Marsh, A., & Gibb, K. (2011). Uncertainty, Expectations and Behavioural Aspects of Housing Market Choices. *Housing, Theory and Society*, 28(3), 215–235. <https://doi.org/10.1080/14036096.2011.599182>

McLoughlin, F., Duffy, A., & Conlon, M. (2012). Characterising domestic electricity consumption patterns by dwelling and occupant socio-economic variables: An Irish case study. *Energy and Buildings*, 48, 240–248. <https://doi.org/10.1016/j.enbuild.2012.01.037>

Mingoya, C. (2015). *Building Together. Tiny House Villages for the Homeless: A Comparative Case Study*. Massachusetts Institute of Technology.

Montgomery, C. (2013). *Happy City: Transforming our lives through urban design*. Toronto, Canada: Doubleday Canada.

Morrow-Jones, H.A., Irwin, E.G., & Roe, B. (2004). Consumer preference for neotraditional neighborhood characteristics. *Housing Policy Debate*, 15(1), 171-202. <https://doi.org/10.1080/10511482.2004.9521498>

Murphy, M. (2014). Tiny Houses as Appropriate Technology. *Communities*, 165, 54-59.

Nelson, C. (2012). The Mass Market for Suburban Low-Density Development is Over. *The Urban Lawyer*, 44(4), 811-826. <http://www.jstor.org/stable/24392422>

Ng, J. (2021). Rise of Nano Flats in Hong Kong has Led to Fall in Living Standards, with Government Policies to Blame, Land Use Group Says. *South China Morning Post*.

Nowicki, M., White, T., & Harris, E. (2022, December 6). Shrinking domesticity: Are 'tiny homes' the perfectly packaged answer to the global housing crisis? *The Sociological Review Magazine*. <https://doi.org/10.51428/tsr.sruz7875>

Pareja, C. (2018). Llegan las casas colmena: Haibu 4.0 propone capsulas de 3 m2 en Barcelona a 250 euros al mes. *Idealista News*, 9-12.

Pavot, W. (2018). The Cornerstone of Research on Subjective Well-Being: Valid Assessment Methodology. In: E. Diener, S. Oishi, L. Tay (Eds.), *Handbook of Well-Being* (pp. 83-93). Salt Lake City, UT: DEF Publishers. https://www.researchgate.net/profile/Louis-Tay/publication/375083911_Handbook_of_Wellbeing/links/653fd484f7d021785f223271/Handbook-of-Wellbeing.pdf#page=84

Pavot, W., & Diener, E. (1993). Review of the Satisfaction With Life Scale. *Psychological Assessment*, 5(2), 164-172. <https://psycnet.apa.org/doi/10.1037/1040-3590.5.2.164>

Penfold, H., Waitt, G., & McGuirk, P. (2018). Portrayals of the Tiny House in Electronic Media: Challenging or Reproducing the Australian Dream Home. *Australian Planner*, 55(3-4), 164-173. <https://doi.org/10.1080/07293682.2019.1632360>

Pinsker, J. (2019). Why Are American Homes So Big? *The Atlantic*.

Rios, P., Montgomery, C., & Friedler, L. (2017). *Social Wellbeing and Sociability in Multi-family Housing Design*. Vancouver, BC.

Sandberg, M. (2017). Downsizing of Housing: Negotiating Sufficiency and Spatial Norms. *Journal of Macromarketing*, 38(2), 154-167. <https://doi.org/10.1177/0276146717748355>

Sandstrom, G.M., & Dunn, E.W. (2014). Social Interactions and Well-Being: The Surprising Power of Weak Ties. *Personality and Social Psychology Bulletin*, 40(7), 910-922. <https://doi.org/10.1177/0146167214529799>

Saxton, M.W. (2019). *The Ecological Footprints of Tiny Home Downsizers: An Exploratory Study*. Virginia Polytechnic Institute and State University.

Scally, D. (2006). Welcome to my Humble Little Cube. *The Irish Times*.

Shearer, H. (2019, Dec 5). *Tiny Houses: Love, Live or Leave? What factors Influence the Decision?* State of Australian Cities Conference 2019. Perth, Western Australia. <https://apo.org.au/node/306846>

Shearer, H., Bares, V., Pieters, R., Winkle, B., & Meathrel, K. (2018). Planning for Tiny Houses. *Australian Planner*, 55(3-4), 147-156. <https://doi.org/10.1080/07293682.2019.1632358>

Shearer, H., & Burton, P. (2019). Towards a Typology of Tiny Houses. *Housing, Theory and Society*, 36(3), 298-318. <https://doi.org/10.1080/14036096.2018.1487879>

Shlay, A.B. (1985). Castles in the Sky: Measuring Housing and Neighborhood Ideology. *Environ. Behav.* 17, 593-626. <https://doi.org/10.1017/CB09781107415324.004>

Stern, P.C., Dietz, T. & Guagnano, G.A. (1995). The New Ecological Paradigm in Social-Psychological Context. *Environ. Behav.* 27, 723-743.

Talen, E. (2006). Design That Enables Diversity: The Complications of a Planning Ideal. *J. Plan. Lit.* 20, 233-249. <https://doi.org/10.1177/0885412205283104>

Tel Aviv-Yafo Local Planning Committee (2015). *Spatial Urban Design Policy: Chapter on Building Planning and Design* (in Hebrew).

The Class Foundation. (2023, Sept 6). Ground-breaking Survey Reveals Impact of Accommodation on Student Well-being and Experience Across Europe. *The Class Foundation*. <https://www.globenewswire.com/en/news-release/2023/09/06/2738007/0/en/Ground-breaking-Survey-Reveals-Impact-of-Accommodation-on-Student-Well-being-and-Experience-Across-Europe.html>

Timmermans, H., Molin, E., & van Noortwijk, L. (1994). Housing Choice Processes: Stated Versus Revealed Modelling Approaches. *Netherlands Journal of Housing and the Built Environment*, 9, 215-227.

Vancouver Foundation. (2012). Connections and Engagement: A Survey of Metro Vancouver. Vancouver, Canada. <https://www.vancouverfoundation.ca/sites/default/files/documents/VanFdn-SurveyResults-Report.pdf>

Willoughby, C., Mangold, S., & Zschau, T. (2020). Small Houses, Big Community: Tiny Housers' Desire for More Cohesive and Collaborative Communities. *Social Sciences*, 9(2), 1-33.

Wong, L.T. (2018). Tiny Affordable Housing in Hong Kong. *Indoor and Built Environment*, 27(9), 1159-1161. <https://doi.org/10.1177/1420326X18792159>

Worsley, J.D., Harrison, P., & Corcoran, R. (2021). The role of accommodation environments in student mental health and wellbeing. *BMC Public Health*, 21, 573. <https://doi.org/10.1186/s12889-021-10602-5>

Wulff, M., Healy, E., & Reynolds, M. (2004). Why Don't Small Households Live in Small Dwellings? - Disentangling a Planning Dilemma. *People and Place*, 12(1), 57-70. <https://doi.org/10.4225/03/590bfb945c4a6>

Yohanis, Y.G., Mondol, J.D., Wright, A., & Norton, B. (2008). Real-life energy use in the UK: How occupancy and dwelling characteristics affect domestic electricity use. *Energy and Buildings*, 40(6), 1053-1059. <https://doi.org/10.1016/j.enbuild.2007.09.001>