Article title: Effect of lockdown on activities of daily living in built environment and well-being
Authors: Sudhir Kumar Pasala[1], Lakshmi Gumpeny[2], Madhu Kosuri[3], Snehalatha Tippana[4], Gumpeny, R Sridhar[5]
Affiliations: Department of Architecture, Andhra University College of Engineering (Autonomous), Visakhapatnam, India[1], Department of General Medicine, Gayatri Vidya Parishad Institute of Healthcare & Medical Technology, Visakhapatnam[2], Department of Psychology and Parapsychology, Andhra University / Wellness Hub, Visakhapatnam, India[3], Kendriya Vidyalaya Sangathan, Vizianagaram, India[4], Endocrine and Diabetes Centre, Visakhapatnam, India[5]
Orcid ids: 0000-0001-7260-8910[1], 0000-0002-1368-745X[2], 0000-0002-1344-890X[3], 0000-0002-6310-171X[4], 0000-0002-7446-1251[5]
Contact e-mail: sridharvizag@gmail.com

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Reviewer: Simone Torresin

The distance reduction has been properly interpreted and corrected. The use of the sampling procedure has been mentioned as a limitation. Additions have been made to the statistical analysis section as suggested. Clarification has been provided for the statement 'Independent variables which have significance of $p<0.05$ with coefficients that have positive association with the dependent variables are discussed'. Reference (11) has been provided for interpretation of R2. Explanation has been given in the Discussion for 'discuss how the information derived from the questionnaire (e.g. information about food intake and watched TV channels) are useful'. Clarity has been provided for Table 2. Differences between vegetarian and non vegetarian food intake has been commented upon. Information has been provided about 'no information about the meaning of the 0-2.5 scale on the vertical axis.' Figure-2 is changed showing "Comparative scale" on y-axis. As suggested, we have commented about 'There does not seem to have any influence of "Generally tensed" and "Worried about health" parameters indicating that the subjects feel safe during lockdown and experience the same confidence as before lockdown in absence of the epidemic'. We addressed whether 'Please describe the relationships expressed by regression coefficients, whether they are relevant and meaningful.' Clarification has been provided about 'yes-no' meaning in Fig 3. We provided clarification for 'We assessed the response of the participants on WfH and found that people whose homes are of group housing/apartment type have no significant relation'. Statements on sleep patterns have been deleted. Discussion and Conclusion have been modified as suggested.

Reviewer: Anna Mavrogianni

Figures have been made larger for better clarity. Details of statistical analysis have been expanded. We thank the suggestion for showing correlation matrix; however due to limitation of time, the data has not been presented. We hope to keep the suggestion for any future studies. Figure 4 has been presented as a bar chart. Discussion on sleep has been deleted.

Effect of lockdown on activities of daily living in built environment and well-being

Authors:
1. Sudhir Kumar Pasala, Department of Architecture, Andhra University College of Engineering (Autonomous), Visakhapatnam, India
2. Lakshmi Gumpeny, Department of General Medicine, Gayatri Vidya Parishad Institute of Healthcare & Medical Technology, Visakhapatnam
3. Madhu Kosuri, Department of Psychology and Parapsychology, Andhra University / Wellness Hub, Visakhapatnam, India
4. Appa Rao Allam, Institute of Bioinformatics and Computational Biology, Visakhapatnam, India
5. Snehalatha Tippana, Kendriya Vidyalaya Sangathan, Vizianagaram, India
6. Sridhar Ramachandra Gumpeny, Department of Endocrinology, Endocrine and Diabetes Centre, Visakhapatnam, India

Abstract

In an effort to arrest the spread of COVID-19 infection, a nation-wide lockdown was declared in India in March 2020. To assess how personal built environment affected the citizens in the first few weeks, an explorative online survey was conducted, eliciting responses about the work habits before the lockdown, the psychological well-being, time spent in various activities, characteristics of those who worked from home, food and sleep patterns. The major difference entailed by the lockdown was a reduction of time and distance of one commute to go to their workplace, which was an average of 30 minutes and 9.5 km respectively. In terms of diet, subjects who were vegetarian did not experience any difference, unlike those who were non-vegetarians. Forced social isolation did not alter the television channels that were viewed. Among those who worked from home in constrained environments, people could find spaces and seem to adapt reasonably to built environment. There was no change in the quality or quantity of sleep during the lockdown. This study in the early weeks of the lockdown documents the way in which individuals lived through it in terms of the built environment at home.

Introduction:

The coronavirus (Covid-19) epidemic, identified at the turn of 2020 has an ability to spread by droplet transmission. There is as yet no vaccine to prevent it, or drugs to cure the infection. The only measures to reduce the transmission consist of physical distancing, frequent washing of hands with soap and water, and avoiding touching the face. Though these are simple to itemize, it is difficult to implement. In an attempt to prevent community spread of infection, India imposed a lockdown, beginning on 22nd March 2020. Depending on the situation, the lockdown has been modified over the course of time.

The uncertainty about the disease coupled with lockdown across the nation led to a stressful situation for the common good. It is understandable that apprehension and anxiety could result from being lonely due to social isolation, fear of being infected, economic impact and uncertainty about the future course

(1). A report that compared psychological distress and loneliness in 2018 and in April 2020 showed that the prevalence of serious psychological distress increased three-fold in April 2020 (1).

Following the outbreak of Covid-19, a number of studies were published on knowledge, attitude and practices (KAP) about the condition from across the world, including different parts of India (2,3,4).

Built environment, refers to ‘‘environments that are modified by humans, including homes, schools, workplaces, highways, urban sprawl, accessibility to amenities, leisure and pollution (5). It is conceivable that the response to the pandemic and measures to slow its spread can be modified by built environment. To our knowledge, there have not been any studies evaluating the effect of built environment on daily living and psychological stress during the lockdown. A report from Brazil studied the spatial correlation between the incidence of Covid-19 and human development (6). Doshi et al reported that fear about Covid-19 was low due to lack of knowledge, although women, lower educational status and being a healthcare worker were associated with higher fear levels (7). In situations such as these, physical interviewing is neither feasible nor desirable. Earlier studies have shown that social media platforms can be employed to recruit as well as to communicate about Covid in both developed and developing countries (8,9). Therefore we have conducted an online survey to assess the effect during the early weeks of lockdown on living habits, attitudes and other aspects influenced by the built environment.

The twin aims of the study is to evaluate how activities of daily living (ADL) have a bearing on well-being during lockdown and how spaces at home support ADL during the “stay home stay safe” strategy. The research questions we attempt to address are (A) Is there a perceptual change in wellbeing during lockdown to that of before lockdown? (B) As a health concern, are there any changes in food habits and rest/sleep? (C) How do people accomplish their responsibilities of work/study?

Methods:

The second phase of lockdown beginning 15th April 2020 till 03rd May 2020 had stringent restrictions of “stay home” with 3-4 hours of relaxation in the morning to take home essential commodities. A structured questionnaire was developed covering different sections in sequence, namely demographics, food intake, activities of daily living, built environment (specifically homes), leisure and entertainment, and health and wellbeing.

This self-reported questionnaire survey designed in Google forms (available in Appendix at the end of the manuscript) was administered online from 19th April 2020 to 07th May 2020, i.e. during and beyond 4 days of the second phase of lockdown (Figure-1). The online questionnaire was circulated to the contacts of the authors by online social media.

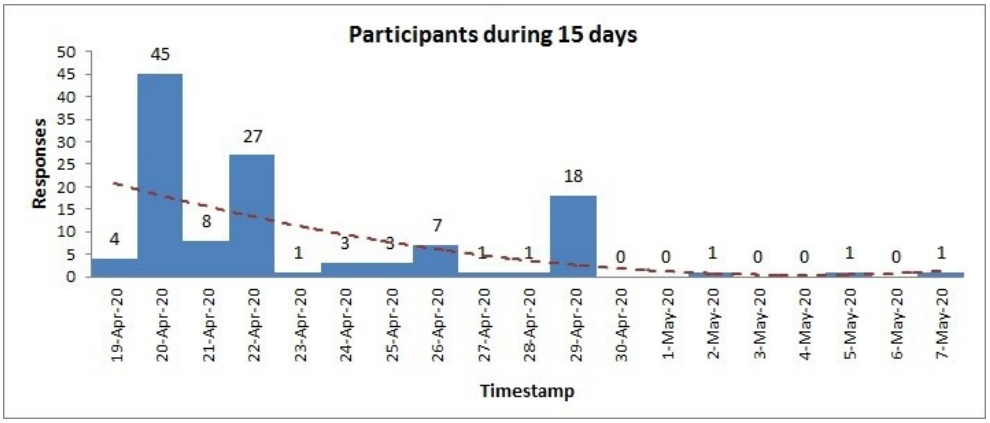

Figure 1: Duration of online survey

The section of Demographics has data pertaining to Age, Gender, Height, Weight, Marital status, Education and Employment. The Food intake section is related to information on changes of intake in principal meals and any change in intake of vegetarian and non-vegetarian food items. Information of activities of daily living covered day-to-day tasks. Questions on the Built environment section related to where their residence is located (area, floor level), type of house (rented/owned, individual/apartment etc.), what spaces do they have and where they spent most of the time during lockdown. Watching television and spending time with family at home being common leisure and entertainment activities, questions were included on the preferences of channels like movies, sports, education, spiritual, serials/drama, music, environment and news. Lastly the section on health and well-being relate to whether they are taking any medication along with six questions on well-being (Feeling in general; Energy, pep or vitality; Feel any tension; Happy, satisfied or pleased with personal life; Feel healthy enough and Concerned or worried about health and well-being). Following the objectives of the study, the wellbeing of the subjects is assessed for the activities of daily living (ADL) and how spaces at home support them using linear regression.

Statistical analysis

Of the 121 responses received, there is considerable demographic representation of age, gender, food habits, profession (Table-1a) and age with physiological parameter of Body Mass Index, BMI (Table-1b). The study is conducted in Andhra Pradesh region of India which constitutes 10.37% of covid-19 confirmed cases to that of the total confirmed cases in the country. The population of the state of Andhra Pradesh is 52 million constituting 0.04% of 135 million population of India. The state of Andhra Pradesh ranks second in total confirmed cases of covid-19 in India (10). With prevailing limitation in conducting physical survey and limited access to online survey methods being a developing country there were 121 respondents with a composition of mean age of 35.5 years (Max: 70-Min: 18), 63% (Male) and 37% (Female), 93% (Work related) and 07% (Home-based) and 73% (Non-vegetarians) and 27% (Vegetarians). The margin of error is 7% for the sample size and population of the study with 90% confidence interval and thus the results differ within 7 percentage points from the real population value 90% of the time. Linear or multiple regression analysis was employed to evaluate the relationship of dependent variables with predictor variables. Independent variables which have

significance of $p<0.05$ with coefficients that represent positive association with the dependent variables are discussed. Smaller values of R^2 may not necessarily be insignificant. In studies of human behaviour which are difficult to predict, a high value of of R^2 has been described as being 'almost impossible' (11), and that a model with low R^2 is not always useless. The variables considered throw light on aspects that could be taken into account to find ways to live with situations like covid-19 pandemic. Statistical analysis using excel is carried out for the parameters of demographics, food intake, ADL, built environment, leisure and entertainment, and health and wellbeing.

Results:

Demographic variables are presented in Table 1a and 1b

Table-1a: Details of responses by gender, food habits and profession

	Gender		Food Habits		Profession		
	Male	Female	Vegetarian	Non-vegetarian	Employee	Student	Home based
Percentage	63%	37%	27%	73%	70%	22%	7%
Number	76	45	33	88	85	27	09

Table-1b: Age and Body Mass Index (BMI)

	Age (in years)	Body Mass Index (BMI)
Mean	35.5	26.3
Standard Deviation	12.9	4.6
Minimum	18.0	15.7
Maximum	70.0	49.9
Number of Subjects	121	121

Food habits: Questions on whether there is any change in food intake were asked. Items like chicken, mutton, fish etc. were considered for non-vegetarian and various types leafy vegetables, tubers, vegetables etc. were considered for vegetarian subjects. Ttest for vegetarian and non-vegetarian groups show significant differences ($p<0.05$) for food intake during lockdown. Further, the standard error of mean for the two groups of vegetarian and non-vegetarian food intake during lockdown show reduction in intake of non-vegetarian items (Figure-2).

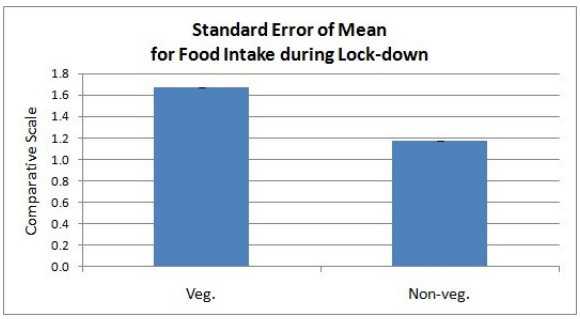

Figure 2: Food intake during lockdown

Health and Wellbeing: Self-reported questions on perception of well-being parameters include "energy, pep, vitality", "happy and satisfied personal life", "feel healthy to work", "generally tensed" and "worried about health". However, a question on "feeling in general" is asked which includes overall perception of health. A regression analysis of different predictor well-being parameters that contribute to "feeling in general" is analysed for both before and during lockdown. The result of 121 subjects show an association of dependent variable of "Feeling in General" with a significance of $p<0.02$, $R^2 = 0.51$ to predictor variables of "energy, pep, vitality" and "feel healthy to work" with a positive coefficient of 0.305 and 0.374 respectively, during the pandemic situation. Whereas the predictor variables of "energy, pep, vitality", "happy and satisfied personal life", "feel healthy to work" show significant relation $p<0.02$ with dependent variable of "feeling in general" observed before lockdown with $R^2=0.60$ indicating a greater reliability with positive coefficients of predictor variables of 0.501, 0.193, 0.207 respectively . There seems to have some influence of "Energy, pep or vitality and Feel healthy to work". From the coefficients, "Energy, pep or vitality" seems to have increased effect before lock-down compared to during lock-down and for "Feel healthy to work" it seems to have improved during lock-down for safe WfH situation". However, the predictor variable of "Happy, satisfied personal life" is prevalent before lock-down. (Table-2).

Watching television-TV: There is significant positive relation with 95% confidence interval and $R^2=0.18$ to "Feeling in General" for the news channels of "News updates on COVID-19 cases" with ($p<0.05$) and "General news updates" with ($p<0.01$) and increasing trends of 0.269 and 0.311 coefficients respectively (Table-3). There is significant relation to "Happy and satisfied personal life" with ($p<0.01$) at 95% confidence interval and $R^2=0.14$ for channels related to "spirituality" with increasing trend of 0.201 coefficient with dependent variable.

Table 2: Regression results

Dependent Variable	Predictor Variable	Coefficients	Standard Error	t Stat	P-value
Feeling in General	During Lockdown				
Sample size=121	Energy, pep or vitality	0.305	0.122	2.504	0.014**
$R^2=0.509$	Happy, satisfied personal life	0.149	0.096	1.556	0.123
Significance, F=2.21E-16	Feel healthy to work	0.374	0.098	3.802	0.000**
Intercept=1.704	Generally tensed	-0.115	0.072	-1.586	0.115
	Worried about health	-0.124	0.073	-1.699	0.092
Feeling in General	Before Lockdown				
Sample size=121	Energy, pep or vitality	0.501	0.088	5.687	0.000**
R2=0.601	Happy, satisfied personal life	0.193	0.071	2.739	0.007**
Significance, F=1.89E-21	Feel healthy to work	0.207	0.083	2.484	0.014**
Intercept=1.189	Generally tensed	-0.066	0.051	-1.285	0.202
	Worried about health	-0.080	0.056	-1.441	0.152
Feeling in General	Watching TV (News Channels)				
Sample size=121	News updates on COVID-19 cases	0.269	0.126	2.130	0.035**
R2=0.189	News updates COVID-19 health precautions	-0.173	0.140	-1.234	0.220
Significance, F=0.00002	General new updates	0.311	0.113	2.740	0.007**
Intercept=3.383					
Happy, satisfied personal life	Watching TV (Leisure Channels)				
Sample size=121	Movies	0.155	0.080	1.938	0.055

R2=0.145	Music	0.055	0.080	0.689	0.492
Significance, F=0.001	Spirituality	0.201	0.077	2.610	0.010**
Intercept=4.069					
Feel healthy to work	Mode of Transport				
Sample size=121	Public transport (Bus/Metro etc.)	-0.190	0.114	-1.665	0.099
R2=0.119	Para transport (Autorickshaw)	0.115	0.136	0.850	0.397
Significance, F=0.023	Company vehicle	0.066	0.076	0.871	0.385
Intercept=4.112	Personal Car	0.161	0.067	2.395	0.018**
	Personal 2-wheeler	0.084	0.068	1.236	0.219
	Shared transport (friends vehicle)	0.014	0.083	0.174	0.862
WfH	Employees living at individual houses irrespective of ownership				
Sample size=22	Bed room	3.253	1.355	2.401	0.029**
R2=0.526	Balcony/Sit-out/Utility	-1.631	0.815	-2.001	0.063
Significance, F=0.024	Front/Back yard	-1.932	1.379	-1.401	0.180
Intercept=10.698	Toilet	-1.752	1.131	-1.550	0.141
	Other Rooms	-1.746	0.958	-1.823	0.087
WfH	Students staying at own houses				
Sample size=21	Bed room	1.540	1.041	1.480	0.160
R2=0.481	Balcony/Sit-out/Utility	1.727	0.803	2.152	0.048**
Significance, F=0.057	Front/Back yard	-2.164	1.212	-1.785	0.095
Intercept=7.882	Toilet	-2.488	1.030	-2.415	0.029**
	Other Rooms	-0.717	0.799	-0.898	0.384
**indicates significance at 95% confidence interval					

Mode of transport: The expectations of the people when the lockdown is released show Mode of transport in personal car has a positive coefficient of 0.161 with "Feel healthy to work" with a significance of ($p<0.02$) with $R^2=0.12$(Table-3).

Built environment and Work from Home (WfH): The average distance of 9.5KM and an average 30 minutes travel by respondents to office/institute have actually saved time and energy that could be contributed to WfH (12). We assessed the relationship of home with WfH in two different aspects. One being the ownership of the house (whether rented, owned or quarters provided by the employer) and the other is the typology of the building (individual house, apartment/group housing and row housing). Group housing is a type of housing consisting of 4-12 tenements in a building whereas apartment has more than 12 tenements in a building. In the 121 samples surveyed, there are three categories of ownership of which 62% of them own the residence, 37.2% stay in rented houses and 0.8% stays in quarters provided by the employer. In typology of building, 52.9% are apartment/group housing, 40.5% are individual/independent houses and 6.6% are of row housing. However, quarters provided by the employer in ownership category and row housing in typology of the building were not considered due to small sample size. Also there are 22 home-based (10 home makers/retired persons and 12 office/businesses operating from home) that were not considered.

The generally available spaces for residential buildings in India are kitchen, living, dining, balcony or sit-out spaces, toilets/washrooms and with more than 90% of them having 1-4 bedrooms (13). The number of dwellings studied consisting of these spaces are shown in the figure (Yes – available and No – Not

available) with few having exclusive spaces viz. store space, home theatre, garage/parking, terrace and back/front yard (Figure 3).

We assessed the response of the participants on WfH and found that people whose homes are of group housing/apartment type that constitute 52.9% have no significant relation which seemingly reflect unfavourable conditions. As mentioned earlier, group housing is a type of housing consisting of 4-12 tenements in a building whereas apartment has more than 12 tenements in a building.

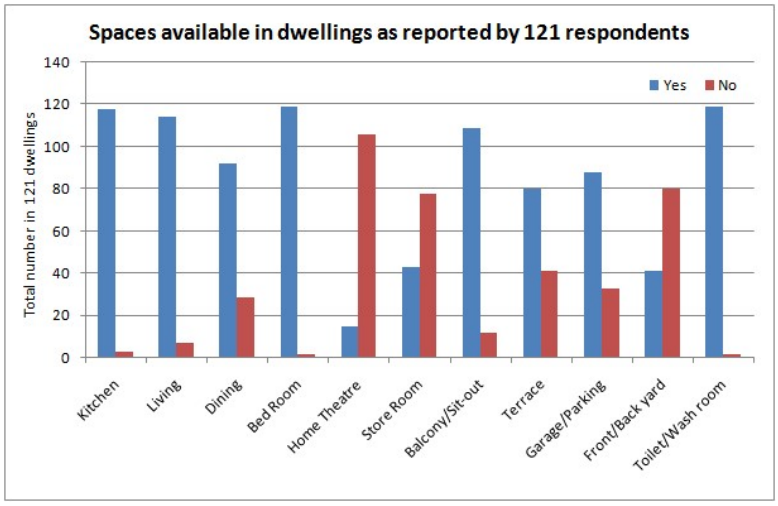

Figure 3: Spaces in dwellings

Those staying in individual houses (22 respondents) irrespective of the ownership prefer WfH from their bed room space ($p<0.05$ and $R^2=0.52$) with 95% confidence interval and a positive 3.253 coefficient (Table-3). As for the students, those who stay at their own houses (21 samples) prefer balcony/sit-out spaces to perform their activities ($p<0.05$ and R2=0.48 with 95% confidence interval) with a positive coefficient of 1.727 with dependent variable WfH. The general living conditions in Indian homes can broadly be categorized under active and passive zones. Activities related to watching TV, family interactions and daily chores of household are performed in active zones that include living, dining and kitchen and are often noisy. Hence the possibility of WfH with no other choice left could happen in bedrooms and sit-outs that are relatively calm and are sufficient in numbers considering the average size of 4-members in a family (Figure 4). However, design of spaces that could accommodate the requirements of formal and calm environments for WfH is important during situations of “stay home stay safe”.

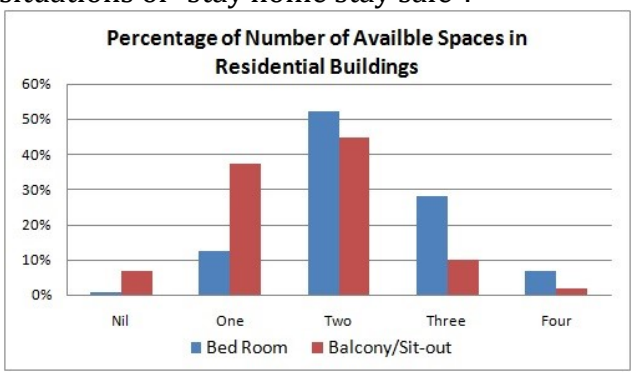

Figure 4: Percentage of number of bedroom and balcony/sitout present in dwellings.

Discussion

We report an exploratory view of how the built environment was impacted by the world's biggest lockdown following the covid pandemic; rather than take a narrow technical deep view of architecture per se in terms of construction, transmissibility and other micro-environmental factors, we considered the different ways in which people responded at home and for work in their immediate built environment.

Essentially we observed that the major difference entailed by the lockdown was a reduction of time and distance to go to their workplace. In terms of food intake, those who ate only vegetarian food did not experience any change, unlike those who were non-vegetarians, who reduced the intake of meat. This was necessitated both by the cost as well as an (unfounded) fear of transmission through meat. The fear amongst people that wet market places are potential threat of transmission of such diseases, there is a need for transformational change in the way they function. The professionals of built environment could rethink on strategies for location and design of wet market places to enhance quality in the way they function and offer safe and healthy places to people.
To fill the time available on hand during the lockdown, watching television at home was a common past-time. Forced social isolation did not alter the channels watched (movies, sports, educational, spiritual, soap operas, music, environment or news). General news and COVID-19 updates seem to have positive wellbeing along with watching spiritual channels. However, there is a need to consider how design of homes, building construction and materials could support multiple activities of home and work hitherto functioning. Acoustics and Internet of Things amongst others could become integral design considerations for the professionals of built environment.

The unprecedented lockdown led to the family staying at home, and accomplishing all their usual activities in an environment for which it was not originally designed, viz employment work, studies, entertainment and leisure all at once by all the family members. Among those who worked from home, most preferred to work from their bedroom. Students preferred to study outside the house, in balconies or in sit-outs.

Sleep is one of the compromises in the modern world, where people are accused of 'gorging themselves with food and starving themselves of sleep' (14). Here was a situation where there was ample time available for sleep/rest, without the distractions of work or the forced circadian disruptions of shift work. However there doesn't seem to have any effect, but the small sample sizes make it difficult to reach valid conclusions. However, factors including fear of being infected, economic uncertainty could have played a major role. It was a period of forced isolation, not volitional vacation; in addition the period of study could have been too short for any changes to be perceived.

Following the recognition of covid-19 pandemic, attention has focused on built environment trends to lower the risk of transmission by the design of buildings (15), as well as other tactile surfaces such as doorknobs, switches, toilet handles and faucet knobs (16). More broad based concerns about the construction of smart cities which can deal with future pandemics consisted of popularization for health science, improving emergency health systems, and keeping in place multi-industry coordination mechanisms, to deal with pandemics (17).
The concept and application of built environment owes its origin to epidemics and pandemics in the past: bubonic plague in the 14th century, yellow fever in the 18th and cholera and small pox in the 19th all resulted in innovations such as broad boulevards, sewer systems, plumbing and urban sprawls (18).

Besides healthy workplaces, telecommuting and online accessibility of various services including telemedicine, distance learning, online shopping and online entertainment are bound to evolve. Houses are not just physical structures, but they are part of a broader social sphere; pandemics disturb the structures and routines that are closely inter-related, which is an interesting macro feature to consider (19). Some of the potential ways covid-19 will impact built environment consist of a shift away from large city offices, a reduced reliance on cars for transport to jobs and development of new forms of public spaces (20).

Ultimately these must lead to rethinking of design, operations, behaviour and maintenance to ensure that first the workplace and thence the economy is less susceptible to disruptions caused by disease (21).

To convert the crisis into an opportunity, one must plan to respond to such unexpected events, re-calibrate transport facilities, the work places to improve spatial distancing, as well as re-design of the environment by fusing blue and green infrastructure (22,23).

Conclusion

The unprecedented lockdown due to COVID-19 pandemic has greatly impacted the behaviours of family staying at home and accomplishing all their usual activities in an environment for which it was not originally designed. The “stay home stay safe” strategy contributed for wellbeing factors of general health, happiness and vitality while keeping away the worry of health and feeling of tensed.

There seems to have some influence of “Energy, pep or vitality and Feel healthy to work”. From the coefficients, “Energy, pep or vitality” seems to have increased effect before lock-down compared to during lock-down and for “Feel healthy to work” it seems to have improved during lock-down for safe WfH situation”. However, the predictor variable of “Happy, satisfied personal life” is prevalent before lock-down.

In terms of food intake, those who ate only vegetarian food did not experience any change, unlike those who were non-vegetarians, who reduced the intake of meat. This was necessitated both by the cost as well as an (unfounded) fear of

transmission through meat. In terms of food intake, those who ate only vegetarian food did not experience any change, unlike those who were non-vegetarians, who reduced the intake of meat. This was necessitated both by the cost as well as an (unfounded) fear of transmission through meat. The fear amongst people that wet market places are potential threat of transmission of such diseases, there is a need for transformational change in the way they function. The professionals of built environment could rethink on strategies for location and design of wet market places to enhance quality in the way they function and offer safe and healthy places to people. With ample time to rest there doesn't seem to have any effect on sleep prior lockdown i.e. during normal days and in lockdown.

Average distance of 9.5KM and an average 30 minutes travel to office/institute have actually saved time and energy in contributing to WfH. The relationship of home with WfH by ownership and typology of the building show that those staying in individual houses irrespective of the ownership prefer WfH from their bed room space whereas for the students, those who stay at their own houses prefer balcony/sit-out spaces to perform their activities. However, the general living conditions in Indian homes with family interactions at living, dining and kitchen that are often noisy, design of spaces that could accommodate the requirements of formal and calm environments for WfH is important during situations of "stay home stay safe". There is a need to consider how design of homes, building construction and materials could support multiple activities of home and work hitherto functioning. Acoustics and Internet of Things amongst others could become integral design considerations for the professionals of built environment.

Some of the potential ways covid-19 will impact built environment consist of a shift away from large city offices, mode of transport and development of new forms of public spaces. More broad based concerns about the construction of smart cities can deal with future pandemics with popularization of health science and improving emergency health systems keeping in place multi-industry coordination mechanisms, to deal with pandemics. Besides healthy workplaces, telecommuting and online accessibility of various services including telemedicine, distance learning, online shopping and online entertainment are bound to evolve.

Limitation of the study

Our exploratory study has limitations in having a small sample of subjects along with inherent biases in the recruitment of subjects who had access to internet, were conversant in English and agreed to participate in the study. The method of online questionnaire circulated to the contacts of the authors on social media is adopted from studies under similar situations (8). Nevertheless, it confirms the principles of built environment on well-being and health (24) and hopefully provides an impetus for development based on sound biopsychosocial concepts.

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Appendix:

Online link to Questionnaire:
https://docs.google.com/forms/d/e/1FAIpQLSdNFuo3S8x4zUE1UG7RtRF52dpONvvJG_T58AYbzCUElbzXjg/viewform?vc=0&c=0&w=1

Reviewer: Simone Torresin

The analysis of result needs to be still improved, as detailed in the following:

1. Abstract: "The major difference entailed by the lockdown was a reduction of time and distance to go to their workplace, which was an average of 8.9 km." Is the distance reduction of 8.9 or 9.5 km, as reported below in the main text? What about time reduction?

   The reduction in distance is considered and people going for work/study are found to be 9.5 km. The earlier mention of 8.9 km was due to incorrect interpretation of home-based respondents which was rectified during the initial comments from the reviewers. With regard to time, the travel time spent is 23 to 38 minutes considering the average speeds of traffic in Indian cities ranging between 15 to 25 Kilometers per Hour.

   Ref: Gaurav A. Deshpande, Mayuresh N. Joshi, Archit Saraswat, Sumedha Sirsikar, 2020, "Traffic Synchronization using Smart Signals", International Research Journal of Engineering and Technology, e-ISSN: 2395-0056 Vol.07 [05], Page 932.

2. "The online questionnaire was circulated to the contacts of the authors by online social media." The limitation of a sampling procedure based on a convenience criterion should be highlighted in the Limitation section.

   A sentence highlighted (underlined) in the following paragraph is appended.

   Limitation of the study

   Our exploratory study has limitations in having a small sample of subjects along with inherent biases in the recruitment of subjects who had access to internet, were conversant in English and agreed to participate in the study. <u>The method of online questionnaire circulated to the contacts of the authors on social media is adopted from studies under similar situations.</u> Nevertheless, it confirms the principles of built environment on well-being and health (22) and hopefully provides an impetus for development based on sound biopsychosocial concepts.

   Ref: Ali AH, Foreman J, Capasso A, Jones AM, Tozan Y, DiClemente RJ. Social media as a recruitment platform for a nationwide online survey of COVID-19 knowledge, beliefs and practices in the United States: methodology and feasibility analysis. BMC Med Res Methodol 2020;20:116 [https://doi.org/10.1186/212874-020-01011-0

3. "Of the 121 responses received, there is considerable demographic representation of age, gender, food habits, profession…" The Authors then refer to the "small sample of subjects" as a study limitation. The Authors should specify whether the 121 responses can be representative and in case of what geographical area and target population, and according to which criteria.

The study is conducted in Andhra Pradesh region of India which constitutes 10.37% of covid-19 confirmed cases to that of the total confirmed cases in country. The population of the state of Andhra Pradesh is 52 million constituting 0.04% of 135 million population of India. The state of Andhra Pradesh ranks second in total confirmed cases of covid-19 in India (Reference). With prevailing limitation in conducting physical survey and limited access to online survey methods being a developing country there were 121 respondents with a composition of mean age of 35.5 years (Max: 70-Min: 18), 63% (Male) and 37% (Female), 93% (Work related) and 07% (Home-based) and 73% (Non-vegetarians) and 27% (Vegetarians). The margin of error is 7% for the sample size and population of the study with 90% confidence interval and thus the results differ within 7 percentage points from the real population value 90% of the time.

We got the margin of error using online calculator.
https://www.surveymonkey.com/mp/margin-of-error-calculator/
https://www.checkmarket.com/blog/how-to-estimate-your-population-and-survey-sample-size/

Ref: https://www.covid19india.org/
Ref: Moore, D. S. and McCabe G. P. Introduction to the Practice of Statistics. New York: W. H. Freeman, p. 443, 1999.

4. "Independent variables which have significance of $p<0.05$ with coefficients that have positive association with the dependent variables are discussed." Are the Authors disregarding independent variables with negative associations with the dependent variables? From Table 3, it does not seem the case. Please clarify.

Independent variables having positive association with the dependent/predictor variables with a significance of $p<0.05$ are discussed.
Independent/predictor variables that have a significance of $p<0.05$ having positive associations with dependent variables are shown in the following table.

Dependent Variable	Predictor Variable	Coefficients	Standard Error	t Stat	P-value
	During Lockdown				
Feeling in General	Energy, pep or vitality	0.305	0.122	2.504	0.014**
	Feel healthy to work	0.374	0.098	3.802	0.000**
	Before Lockdown				
Feeling in General	Energy, pep or vitality	0.501	0.088	5.687	0.000**
	Happy, satisfied personal life	0.193	0.071	2.739	0.007**
	Feel healthy to work	0.207	0.083	2.484	0.014**

Dependent Variable	Predictor Variable	Coefficients	Standard Error	t Stat	P-value
	Watching TV (News Channels)				
Feeling in General	News updates on COVID-19 cases	0.269	0.126	2.130	0.035**
	General new updates	0.311	0.113	2.740	0.007**
	Watching TV (Leisure Channels)				
Happy, satisfied personal life	Spirituality	0.201	0.077	2.610	0.010**
	Mode of Transport				
Feel healthy to work	Personal Car	0.161	0.067	2.395	0.018**
	Employees living at individual houses irrespective of ownership				
WfH	Bed room	3.253	1.355	2.401	0.029**
	Students staying at own houses				
WfH	Balcony/Sit-out/Utility	1.727	0.803	2.152	0.048**
**indicates significance at 95% confidence interval					

Independent/predictor variable that have a significance of p<0.05 having negative association with dependent variable is shown in the following table.

Dependent Variable	Predictor Variable	Coefficients	Standard Error	t Stat	P-value
	Students staying at own houses				
WfH	Toilet	-2.488	1.030	-2.415	0.029**
**indicates significance at 95% confidence interval					

Independent variable of WfH has a negative association with the dependent/predictor variable of Toilet with a significance of p<0.05 which was however not reported in the study. Following is the explanation for the reason of not reporting in the study.

"The study makes an attempt to understand the relation of available spaces at home with that of Work-from-home, WfH through the questionnaire survey. Questions on availability of spaces with multiple options (Living, Kitchen, Bedroom, Toilet etc. – whether available: Yes/No) were asked and a question on how do they rate their homes suitability for WfH. Regression analysis was carried out for WfH with that of all the available spaces at home and it could be that the response to toilets is not given by the participants and possibly has negative association and not reported in the study."

5. "While R2 of greater than 50% is considered significant, in sociological and psychological studies low R2 do have relevance (10) specifically considering the unprecedented situation that humankind encounters and volatile experience of the respondent to comprehend." This explanation is not clear to me and the link to the reference is not active. Please provide a clearer explanation about the relevance of independent variables explaining only a small percentage of the variance in the dependent variables and please include references to scientific publications you are considering on this topic.

   Reference no (11) provides context to the significance of R^2

6. The Authors investigated the impacts of the Covid situation on several different daily activities and aspects. The Authors state that: "The variables considered throw light on aspects that could be taken into account to find ways to live with situations like covid-19 pandemic." Please discuss how the information derived from the questionnaire (e.g. information about food intake and watched TV channels) are useful and can inform about strategies to adopt in pandemic situations.

   In Results (Section: Watching television-TV)
   There is significant positive relation with 95% confidence interval and R^2=0.18 to "Feeling in General" for the news channels of "News updates on COVID-19 cases" with ($p<0.05$) and "General news updates" with ($p<0.01$) and increasing trends of 0.269 and 0.311 coefficients respectively (Table-3). There is significant relation to "Happy and satisfied personal life" with ($p<0.01$) at 95% confidence interval and R^2=0.14 for channels related to "spirituality" with increasing trend of 0.201 coefficient with dependent variable.

   In Discussion
   Essentially we observed that the major difference entailed by the lockdown was a reduction of time and distance to go to their workplace. In terms of food intake, those who ate only vegetarian food did not experience any change, unlike those who were non-vegetarians, who reduced the intake of meat. This was necessitated both by the cost as well as an (unfounded) fear of transmission through meat. To fill the time available on hand during the lockdown, watching television at home was a common past-time. Forced social isolation did not alter the channels watched (movies, sports, educational, spiritual, soap operas, music, environment or news).

7. Table 2 is not clear. Why are items different between vegetarian and non-vegetarian? In addition, some items are of difficult interpretation (e.g. "never had": does it refer to specific food types, or in general to "food intake during lockdown", as reported in the table heading? Please clarify).

Food Intake During Lockdown					
Non-vegetarian			Vegetarian		
Intake	Number	Percentage	Intake	Number	Percentage
Never had	14	15.9%	As usual	20	60.6%
Started	08	9.1%	Light increase	05	15.2%
Stopped	15	17.0%	Moderate increase	07	21.2%
Increased	11	12.5%	Heavy increase	01	3.0%
Remained the same	24	27.3%	Total	33	100%
Reduced	16	18.2%			
Total	88	100%			

We asked a question on how was the usual food intake of vegetarian items by both the categories (vegetarians and non-vegetarians) before lock-down. In addition, specific question was asked on how was the intake of the non-vegetarian food items (like eggs, poultry, meat, fish etc.) during lock-down. And for vegetarians, a follow-up question on change of usual food intake of vegetarian items was asked. This is the reason for variation in the differences.

The column 'Percentage' in Non-vegetarian section of the table represents the percentage to total number of responses given for each non-vegetarian food items and corresponding number in 'Number' column. The Table, we believe could be omitted as the Chi-square test that follows the Table-2 explains the change in food intake which is more relevant.

8. "Ttest for vegetarian and non-vegetarian groups show significant differences ($t<0.05$) for food intake during lockdown." Please describe those differences, if relevant.

"This could be read in continuation with the above explanation (Item-7) for the questions asked on food intake before and during lock-down for both the categories. Thus the Chi-square test shows the differences in change of food intake during lock-down with brief description given in the 'Discussion' section as follows,"

In terms of food intake, those who ate only vegetarian food did not experience any change, unlike those who were non-vegetarians, who reduced the intake of meat. This was necessitated both by the cost as well as an (unfounded) fear of transmission through meat.

9. Fig. 2 is also not clear. The table is about the food intake during the lockdown, but the reader has no information about the meaning of the 0-2.5 scale on the vertical axis.

Data was collected on usual intake and intake during lock-down for breakfast, lunch, evening snacks, dinner and various items of food like leafy vegetables, legumes, meat, fish etc. The table shows mainly shows the change in average cumulative food intake. The scale is conveniently taken index for comparing the change in food intake.

10. " There does not seem to have any influence of "Generally tensed" and "Worried about health" parameters indicating that the subjects feel safe during lockdown and experience the same confidence as before lockdown in absence of the epidemic" Why the Authors can draw such conclusions? Please specify.

    R2 varies with 0.509 during lock-down and 0.601 before lock-down for the predictor variables taken. Considering the critical situation faced, we were expecting much greater variation. However, we would like to revise the statement as follows,

    There seems to have some influence of "Energy, pep or vitality and Feel healthy to work". From the coefficients, "Energy, pep or vitality" seems to increased effect before lock-down compared to during lock-down and for "Feel healthy to work" seems to have improved during lock-down safe WfH situation". However, the predictor variable of "Happy, satisfied personal life" is prevalent before lock-down.

11. "There is significant positive relation with 95% confidence interval and R2=0.18 to "Feeling in General" for the news channels of "News updates on COVID-19 cases" with ($p<0.05$) and "General news updates" with ($p<0.01$) (Table-3). There is significant relation to "Happy and satisfied personal life" with ($p<0.01$) at 95% confidence interval and R2=0.14 for channels related to "spirituality"." Are data suggesting that e.g. people watching news on Covid generally felt better? Please describe the relationships expressed by regression coefficients, whether they are relevant and meaningful.

    Reference no (11) provides context to the significance of R^2

12. "the average distances of 9.5 KM travelled by the remaining 99 office/institute going respondents have actually saved time and energy that could be contributed to WfH." Is 9.5 km a distance reduction? Please specify.

    Addressed in Item-1 above.

13. Fig. 3. It is not clear what "yes/no" refers to.

Data was collected on the type of rooms (bed room, living etc.) and 'yes' represents that the room is available and 'no' means that the type of space is not available.

The same clarification is now included in the text, (Yes – available and No – Not available).

14. "We assessed the response of the participants on WfH and found that people whose homes are of group housing/apartment type have no significant relation." Please clarify the investigated relation (relation with?).

This is with reference to the section of "Built environment and Work from Home (WfH)" which dealt with looking at associations of the type of housing and preferences of people to work at home. As there was no association with WfH for 52.9% of apartment/group housing as compared to 40.5% independent housing typology, we made a specific mention about that. However, we made the following modification hoping for improved presentation of the analysis.

"We assessed the relationship of home with WfH in two different aspects. One being the ownership of the house (whether rented, owned or quarters provided by the employer) and the other is the typology of the building (individual house, apartment/group housing and row housing). Group housing is a type of housing consisting of 4-12 tenements in a building whereas apartment has more than 12 tenements in a building. In the 121 samples surveyed, there are three categories of ownership of which 62% of them own the residence, 37.2% stay in rented houses and 0.8% stays in quarters provided by the employer. In typology of building, 52.9% are apartment/group housing, 40.5% are individual/independent houses and 6.6% are of row housing. However, quarters provided by the employer in ownership category and row housing in typology of the building were not considered due to small sample size. Also there are 22 home-based (10 home makers/retired persons and 12 office/businesses operating from home) that were not considered.

The generally available spaces for residential buildings in India are kitchen, living, dining, balcony or sit-out spaces, toilets/washrooms and with more than 90% of them having 1-4 bedrooms (11). The number of dwellings studied consisting of these spaces are shown in the figure (Yes – available and No – Not available) with few having exclusive spaces viz. store space, home theatre, garage/parking, terrace and back/front yard (Figure 3). We assessed the response of the participants on WfH and found that people whose homes are of group housing/apartment type that constitute 52.9% have no significant relation which seemingly reflect unfavourable conditions. As mentioned earlier, group housing is a type of housing consisting of 4-12 tenements in a building whereas apartment has more than 12 tenements in a building. Those staying in individual houses (22

respondents) irrespective of the ownership prefer WfH from their bed room space ($p<0.05$ and $R2=0.52$) with 95% confidence interval and a positive 3.253 coefficient (Table-3). As for the students, those who stay at their own houses (21 samples) prefer balcony/sit-out spaces to perform their activities ($p<0.05$ and $R2=0.48$ with 95% confidence interval) with a positive coefficient of 1.727 with dependent variable WfH. The general living conditions in Indian homes can broadly be categorized under active and passive zones. Activities related to watching TV, family interactions and daily chores of household are performed in active zones that include living, dining and kitchen and are often noisy. Hence the possibility of WfH with no other choice left could happen in bedrooms and sit-outs that are relatively calm and are sufficient in numbers considering the average size of 4-members in a family (Figure 4). However, design of spaces that could accommodate the requirements of formal and calm environments for WfH is important during situations of "stay home stay safe".

15. Sleep patterns: the observed results are limited by the fact that R2 values are very small and regression coefficients are close to zero. Authors should comment on these aspects.

    This is omitted in the revised manuscript submitted following the initial comments of reviewers.

16. Discussions: discussions must carefully follow the analysis of results, with reference to the observed effect size and variability explained on the dependent variables by the independent ones.

    Explanations made now for all the items, pending Item 5, 6, 11 & 17 could satisfy this item. Items 5&11 relate to AK Singh reference which I could not find and am trying.

17. Conclusions: please clearly refer and answer to the three research questions stated in the Introduction (e.g. through a bullet point or three distinct paragraphs).
    In Introduction:
    The twin aims of the study is to evaluate how activities of daily living (ADL) have a bearing on well-being during lockdown and how spaces at home support ADL during the "stay home stay safe" strategy. The research questions we attempt to address are (A) Is there a perceptual change in wellbeing during lockdown to that of before lockdown? (B) As a health concern, are there any changes in food habits and rest/sleep? (C) How do people accomplish their responsibilities of work/study?

    In Conclusion:
    The unprecedented lockdown due to COVID-19 pandemic has greatly impacted the behaviours of family staying at home and accomplishing all their usual activities in an environment for which it was not originally designed. The "stay home stay safe" strategy contributed for wellbeing

factors of general health, happiness and vitality while keeping away the worry of health and feeling of tensed. However, there seems to have an (unfounded) fear of transmission impacting their food habits and with ample time to rest there doesn't seem to have any effect on sleep compared to prior lockdown or during normal days. While there are difficulties in performing the activities of daily living mainly of work and leisure related in constrained environments, people could find spaces and seem to adapt with reasonable modifications to built environment. WfH could also benefit with reduced effort in travel distance and time by whatever mode of transport they opt. Forced social isolation did not alter the TV channels watched at home and family members seemingly found new ways and means of entertainment.

Some of the potential ways covid-19 will impact built environment consist of a shift away from large city offices, mode of transport and development of new forms of public spaces. More broad based concerns about the construction of smart cities can deal with future pandemics with popularization of health science and improving emergency health systems keeping in place multi-industry coordination mechanisms, to deal with pandemics. Besides healthy workplaces, telecommuting and online accessibility of various services including telemedicine, distance learning, online shopping and online entertainment are bound to evolve.

Reviewer: Anna Mavrogianni

In addition to Simone Torresin's comments, I would like to make some further suggestions:

1. Additional discussion on the statistical representativeness of the surveyed sample (both people as well as buildings) would be very welcome.

   This is addressed above in Item-2&3 of the other reviewer.

2. There appear to be some issues with the text and figure formatting in the PDF format. Also, I would suggest making the figures slightly bigger.

   Making the changes.

3. I was wondering if part of the information included in Table 3 could also be displayed in a correlation matrix (together with additional correlations), if you had the time.

   Thanks for your understanding about the time factor to perform the useful calculation that was suggested

4. A bar chart would be more appropriate to visualise the data contained in the pie charts of Figure 4.

Making the changes.

5. "Night sleep and siesta were significant at a $p<0.01$ at 95% confidence interval with R2 of 0.06 and 0.09 respectively (Table-3)." > I'm not sure I understand this, the R2 is low?

   Following the initial review we omitted the content.