# *The Change of Vancouver Housing Price Under Covid-19 (2020 Feb - 2021 Feb)*

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# *Introduction*

Under the COVID-19, people's daily life was affected in many ways. Restaurant, cinema and shopping center are all being hit by pandemic, which are all tied with  citizens' financial situation. In Vancouver, the housing price has been dramatic fluctuated before COVID-19.The survey is to investigate the housing price fluctuation due to the pandemic from 2020 February to 2021 February.

## *Topic of interest:*

This repot present the findings of the housing price from 2020 February to 2021 February survey. Key survey topic included:

- The price of each household type
- The area of each household type
- The housing price of each region
- The average housing prices

## *Research questions:*

- This survey is made to understand how the housing price changed due to the paramedic. Is it fluctuated generally or dramatically? In the overall look, is it increasing or decreasing?
- To be more specific, which region of housing prices are increased or decreased?
  Which type of household becomes more valuable?

## *Limit of our research questions:*

- We are only considering the housing price from property type, location and monthly average. However, there are more factors that affect the housing price, such as the government policies, mortgage rate and abundance of foreign buyers. Thus, our research is not limited from these perspectives.

# *Method*

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We used someone else's survey data for our research question.The survey data we are using is from Canadian Real Estate Association where they use the MLS® Home Price Index (HPI) to gauge home price levels and trends. It consists of a set of software tools configured to provide time-related indices on residential markets of participating real estate boards in Canada.(Reference 1)

We think this survey data suits our research question because they contain the information we need such as household type and property price. Moreover, it is organized monthly, which will help us with data analysis.

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- **Target population:** All the households in B.C that are on sale.
- **Sample frame:** The household that is sold through Canadian Real Estate Association.
- **Sample unit:** individual sold household
- **Observation unit**:Individual sold household
- **Selection bias / inaccuracy respond:**
    1. The household that is not sold through Canadian Real Estate Association.
    2. The price difference for new constructions and old construction
    3. There are other cities in B.C that are not included in the survey data.
    4. Not considering all household types.

## Why do we choose Stratified Sampling?

We are using stratified sampling for our research questions. Since, the housing market is affected by various factors, such as, different property types and locations, which leads to different housing prices. Thus, we can separate our total population into different subgroups. If the characteristic interest takes in very different values on different subgroups, we can often get a more precise estimator by using stratified random samples. Our characteristic interest in this topic is how different factors affect the housing price during Covid-19.

For our survey design and survey dataset, we do not know about the total population.We take a stratified SRS and size nh form the nth stratum. The total

population is the all the B.C household price and we get a more precise estimator by using stratified sampling. We use different provinces in B.C as different subgroups.

- Total population = All the household that is sold in B.C during 2020 february to 2021 February
- We estimate total of 100000 sales in 2020 February to 2021 February.(Reference 2)
- We divide into 7 province groups: Vancouver island, Victora, Lower mainland, Great Vancouver, Fraser Valley, Chilliwack and district and okanagan valley
- For each group we have 7 household type: Composite, Single Family, One_Storey, Two_Storey, TownHouse, Apartment

## *Result*

We are using two different plots to analyze the survey data. By examining these plots we will give the conclusion of our research questions and summarize the housing market during Covid-19 pandemic.



**The average housing price in different area**
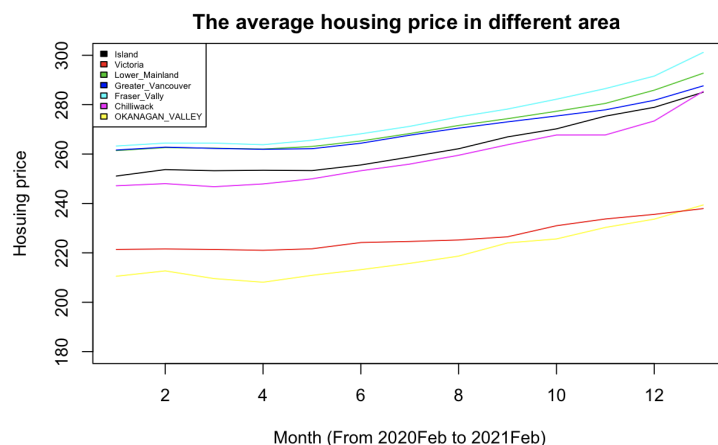
From the plot on the left side, the tendency of average housing price in each region has increased during this 13 month period (2020 February ~ 2021 February). The housing price outside of the Victoria region has apparently risen, while the housing price in Victoria has generally increased by around 15 million.

**The housing price of different property type in each region:**



**The housing prise of different property type in Vancouverr island**
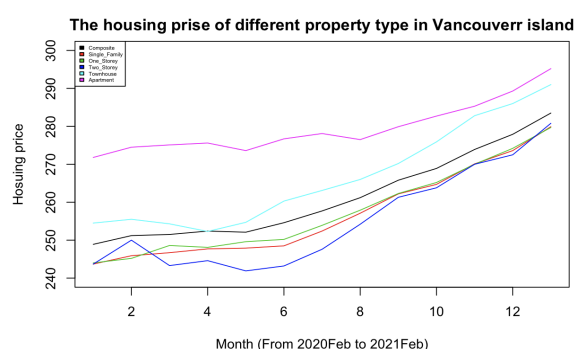
In Vancouver Island, apartment is the most valuable property type during the time period. Comparing the housing price tendency with other property types,

it is relatively general, while others has dramatically increased.



**The housing prise of different property type in Victoria**
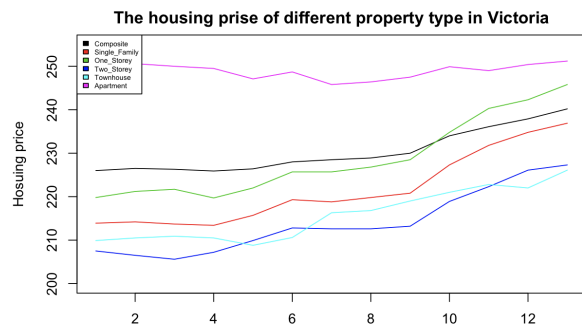
In Victoria, apartment is the most valuable property type, which is still in the top one position during the period. While the price of apartments was relatively stable, all other types of property had an apparent increase in the housing price.



**The housing prise of different property type in Lower mainland**
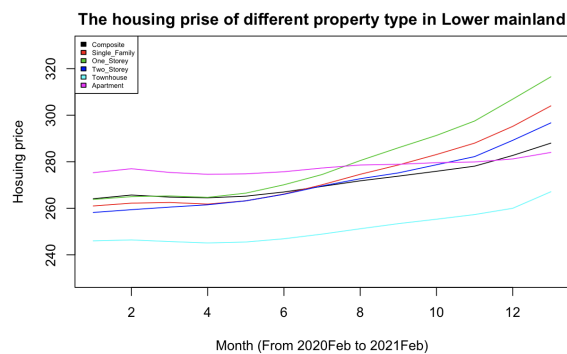
In Lower Mainland, the most valuable property type was one storey in February 2021 replacing apartment in February 2020. The housing price of apartment stay stable while other types have apparently increased.



**The housing prise of different property type in Great vancouver**
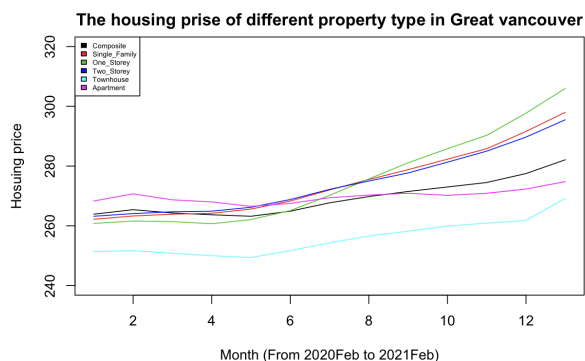
In Greater Vancouver, the most valuable property type was one storey in February 2021. Other than townhouses, the housing price difference of each type is small in February 2020. At the end of this time period, the housing price gap of every property type become larger.



**The housing prise of different property type in Fraser Valley**
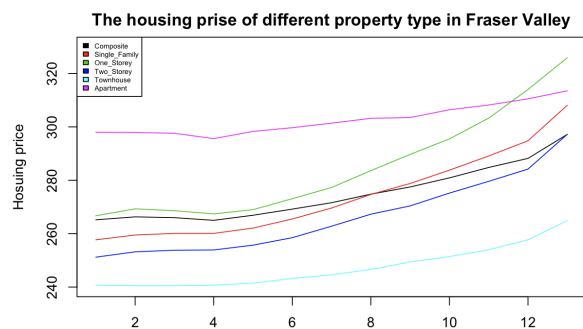
In Fraser Valley, the most valuable property type is one storey in February 2020, replacing apartment in the last two month. All the property types have apparently increased in the housing price during this time period.



**The housing prise of different property type in Chilliwack**
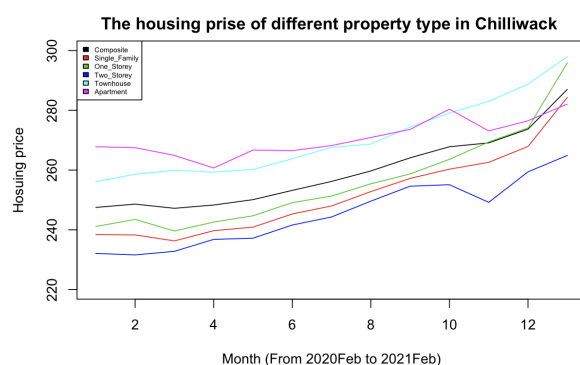
In Chilliwack, the most valuable property type is townhouse. In contrast, the housing price of townhouses in other regions is the lowest. One storey takes the second position, while it has dramatically increased during the time period.

The housing prise of different property type in Okanagan_Vally
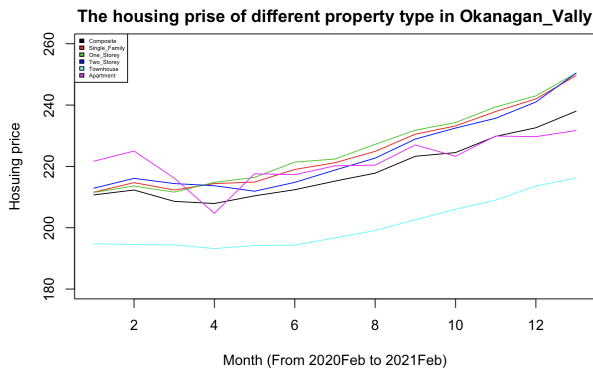
In Okanagan, the housing price of single family, one storey and two storey are in the top in February 2021. There is a large gate between the top three property types and composites and apartments.

## *Discussion and Conclusion*

Based on the above results and plot, the overall housing price in B.C is increasing during the Covd-19 pandemic. Fraser valley has the highest average housing price, followed by Lower Mainland, Greater Vancouver, Vancouver Island, Chilliwack, Okanagan valley and Victoria. The housing price gap between the top 4 and last 2 is big, approximately 30 million dollar.

Looking at each region, apartments are the most valuable property type in both Vancouver Island and Victoria. One storey takes the top 1 position in the rest region except in Chilliwack. The most special one is that townhouses are the most valuable property type in Chilliwack, while this property type has the lowest price in most of the region.

It is interesting to see that during the pandemic the housing price is not dropping instead it is steadily increasing in B.C. Housing is still a demand even though the pandemic hugly impacts the world economy. The apartment and smaller houses increased significantly in price compared with larger houses. Moreover, the houses around the suburban region in B.C become more valuable.

With the effect of pandemic, people are more concerned about their safety and most people are working from home. We think these may be the potential reasons that caused the housing price increase significantly in the suburban area. The reason that causes housing price increase in B.C during a pandemic will be another topic to discover. We think it is also interesting to work on.

# *Reference*

Chan, K. (2021, January 27). BC home sales in 2021 forecast to return to 2016's red hot

volumes. Retrieved from

https://dailyhive.com/vancouver/bc-residential-home-sales-forecast-2021

Try the MLS® HPI Tool – CREA. (2021a). Retrieved from

https://www.crea.ca/housing-market-stats/mls-home-price-index/hpi-tool/

# Appendix

The line plot for each province we used RStudio:

```
# Vancouver island
plot(c(1:13), as.numeric(unlist(island[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Vancouverr island",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(240,300))
lines(c(1:13), as.numeric(unlist(island[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(island[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(island[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(island[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(island[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.4)
```

```
# Victoria
plot(c(1:13), as.numeric(unlist(victoria[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Victoria",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(200,255))
lines(c(1:13), as.numeric(unlist(victoria[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(victoria[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(victoria[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(victoria[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(victoria[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.5)
```

```r
# Lower Land
plot(c(1:13), as.numeric(unlist(lowermainland[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Lower mainland",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(230,330))
lines(c(1:13), as.numeric(unlist(lowermainland[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(lowermainland[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(lowermainland[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(lowermainland[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(lowermainland[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.5)

# Greatvancouver
plot(c(1:13), as.numeric(unlist(greatvancouver[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Great vancouver",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(240,320))
lines(c(1:13), as.numeric(unlist(greatvancouver[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(greatvancouver[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(greatvancouver[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(greatvancouver[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(greatvancouver[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.5)

# Fraservalley
plot(c(1:13), as.numeric(unlist(fraservalley[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Fraser Valley",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(240,330))
lines(c(1:13), as.numeric(unlist(fraservalley[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(fraservalley[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(fraservalley[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(fraservalley[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(fraservalley[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.5)

# Chilliwack
plot(c(1:13), as.numeric(unlist(chilliwack [,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Chilliwack ",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(220,300))
lines(c(1:13), as.numeric(unlist(chilliwack[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(chilliwack[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(chilliwack[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(chilliwack[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(chilliwack[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.5)
```

```r
# Vancouver island
# Composite
plot(c(1:13), as.numeric(unlist(okangan[,2])), type = "l",
     col = unique(types)[1],
     main = "The housing prise of different property type in Okanagan_Vally",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(180,260))
lines(c(1:13), as.numeric(unlist(okangan[,3])),col = unique(types)[2])
lines(c(1:13), as.numeric(unlist(okangan[,4])),col = unique(types)[3])
lines(c(1:13), as.numeric(unlist(okangan[,5])),col = unique(types)[4])
lines(c(1:13), as.numeric(unlist(okangan[,6])),col = unique(types)[5])
lines(c(1:13), as.numeric(unlist(okangan[,7])),col = unique(types)[6])
legend("topleft", fill = unique(types),
       legend = c(levels(types)),
       cex=0.4)
```

```r
types_avg = factor(c("Island","Victoria","Lower_Mainland","Greater_Vancouver","Fraser_Va
lly","Chilliwack","OKANAGAN_VALLEY"),  levels = c("Island","Victoria","Lower_Mainland",
"Greater_Vancouver","Fraser_Vally","Chilliwack","OKANAGAN_VALLEY"))

#producing the average accroding to these three region each month
bc_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + island[i,j] + victoria[i,j] + lowermainland[i,j] + greatvancouver[i,j] +
fraservalley[i,j] +  chilliwack[i,j]
  }
  bc_avg[i] = sum /36
}
bc_avg
```

```r
# producing the average housing price each month in the island
island_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + island[i,j]
  }
  island_avg[i] = sum /6
}
island_avg
```

```r
# producing the average housing price each month in the victoria
victoria_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + victoria[i,j]
  }
  victoria_avg[i] = sum /6
}
victoria_avg
```

```r
# producing the average housing prise each month in the lower mainland
lower_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + lowermainland[i,j]
  }
  lower_avg[i] = sum /6
}
lower_avg
```

```r
# producing the average housing prise each month in the greater mainland
great_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + greatvancouver[i,j]
  }
  great_avg[i] = sum /6
}
great_avg
```

```r
# producing the average housing prise each month in the fraser vally
fraser_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + fraservalley[i,j]
  }
  fraser_avg[i] = sum /6
}
fraser_avg
```

```r
# producing the average housing prise each month in the okanagan
okan_avg = matrix(data = rep(NA), nrow = 13, ncol = 1)
for (i in 1:13 ){
  sum = 0
  for (j in 2:7){
    sum = sum + okangan[i,j]
  }
  okan_avg[i] = sum /6
}
okan_avg
```

```r
plot(c(1:13), as.numeric(unlist(okan_avg)), type ="l",
     col = unique(types_avg)[7],
     main = "The average housing price in different area ",
     xlab = "Month (From 2020Feb to 2021Feb)",
     ylab = "Hosuing price",
     ylim = c(180,300))
lines(c(1:13), as.numeric(unlist(island_avg)),col = unique(types_avg)[1])
lines(c(1:13), as.numeric(unlist(victoria_avg)),col = unique(types_avg)[2])
lines(c(1:13), as.numeric(unlist(lower_avg)),col = unique(types_avg)[3])
lines(c(1:13), as.numeric(unlist(great_avg)),col = unique(types_avg)[4])
lines(c(1:13), as.numeric(unlist(fraser_avg)),col = unique(types_avg)[5])
lines(c(1:13), as.numeric(unlist(chilliwack_avg)),col = unique(types_avg)[6])
legend("topleft", fill = unique(types_avg),
       legend = c(levels(types_avg)),
       cex=0.5)
```