

## The Face of Science during COVID-19: A call to personal action!

A project by:

- Mayur Khandelwal
- Elena Li BSc(SCM)
- Sadia Masood
- Janet Miller MPH
- Matthew Seary BSc
- Brian von Konsky PhD(Curtin) FACS CP



A collaborative effort undertaken for the Australian Computer Society [ACS](https://www.acs.org.au/) (<https://www.acs.org.au/>) Flatten the Curve [Hackathon](https://membership.acs.org.au/flattenthecurvehack.html) (<https://membership.acs.org.au/flattenthecurvehack.html>).

## Exponential Growth - Like doubling grains of rice on a chess board

Why are people worried about COVID-19? Consider this thought experiment. How much rice would you need if you doubled the number of grains of rice on successive squares of a chessboard? Put one grain of rice on the first square, two on the next, four on the one after that, and so on. In the end, there would be

9,223,372,036,854,775,808 grains of rice in the last

square. There would be 18,446,744,073,709,551,615 grains of rice on the chessboard in total. Now that's a lot of rice! Don't believe it? Check the math for yourself below.



So what does this mean for COVID-19? If one infected person infects two others, and each of them infect two others, and so on and so on and so on, then a lot of people end up getting infected. This is why the authorities are worried. Rather than being frightened, though, take action and responsibility to safeguard your health, and that of your family, neighbors, and vulnerable people in the community. This site will help you to do so!

## References

Hutchens, Gareth (2020) The exponential growth of coronavirus can be explained by rice on a chessboard, And we should be worried. ABC News. Accessed 5 April 2020. <https://www.abc.net.au/news/2020-04-05/coronavirus-exponential-growth-explained-by-rice-on-a-chessboard/12122214> (<https://www.abc.net.au/news/2020-04-05/coronavirus-exponential-growth-explained-by-rice-on-a-chessboard/12122214>)

McGeddon (2016) Wheat and chessboard problem.jpg. Creative Commons Attribution-Share Alike 4.0 International License. Accessed 10 April 2020. [https://commons.wikimedia.org/wiki/File:Wheat\\_and\\_chessboard\\_problem.jpg](https://commons.wikimedia.org/wiki/File:Wheat_and_chessboard_problem.jpg) ([https://commons.wikimedia.org/wiki/File:Wheat\\_and\\_chessboard\\_problem.jpg](https://commons.wikimedia.org/wiki/File:Wheat_and_chessboard_problem.jpg))

```
In [1]: 1 import flattenthecurvehack as hack
        2 hack.rice_on_chess_board()
```

<https://www.kaggle.com/bokeh51934/surge> successfully loaded.

Out[1]:

	total	last square
Square Number		
1	1	1
2	3	2
3	7	4
4	15	8
5	31	16
6	63	32
7	127	64
8	255	128
9	511	256
10	1023	512
11	2047	1024
12	4095	2048
13	8191	4096
14	16383	8192
15	32767	16384
16	65535	32768
17	131071	65536
18	262143	131072
19	524287	262144
20	1048575	524288
21	2097151	1048576
22	4194303	2097152
23	8388607	4194304
24	16777215	8388608
25	33554431	16777216
26	67108863	33554432
27	134217727	67108864
28	268435455	134217728
29	536870911	268435456
30	1073741823	536870912
31	2147483647	1073741824
32	4294967295	2147483648
33	8589934591	4294967296
34	17179869183	8589934592
35	34359738367	17179869184
36	68719476735	34359738368
37	137438953471	68719476736
38	274877906943	137438953472

## Computer Models in Simple Terms and What They Mean for Me

Computer programs have been written to project how a disease will progress in the community. These programs consider the rate at which people become infected from contact with someone who already has the disease. Social distancing limits contact, and therefore reduces the spread of disease within the community.

There is some uncertainty how long someone remains sick or infected and sheds virus, which can also be considered in such a model.

You can try varying these features of COVID-19 by changing values in the scrollbars below.

Use the computer model below to consider these questions from a personal point of view:

- If everyone in the community practiced social distancing the way I do, what would be the outcome of the disease?
- If everyone in the community practiced social distancing the opposite of the way I do, what would be the overall outcome?
- If I've been sick, should I stay at home even after I'm feeling better, given uncertainty of how long I might be contagious?

### References

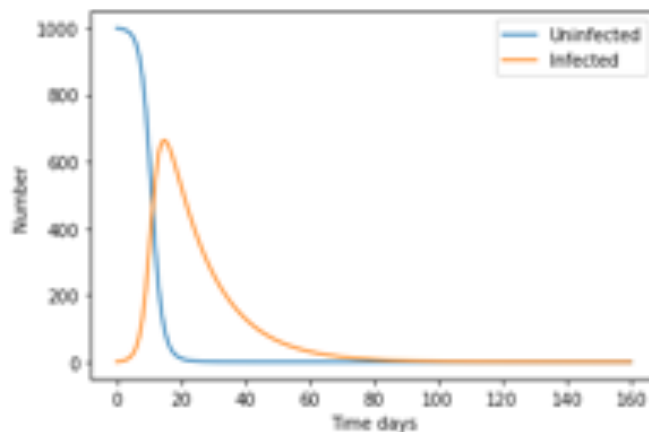
Hill, Christian (2016) Chapter 8: SciPy, Additional Examples, The SIR epidemic Model in Learning Scientific Programming with Python is published by Cambridge University Press (ISBN: 9781107428225) Accessed 9 April 2020. <https://scipython.com/book/chapter-8-scipy/additional-examples/the-sir-epidemic-model/> (<https://scipython.com/book/chapter-8-scipy/additional-examples/the-sir-epidemic-model/>)

Tom Rocks Maths (2020) Oxford Mathematician explains SIR disease model for COVID-19 (Coronavirus). Accessed 10 April 2020. <https://youtu.be/NKMHhm2Zbkw> (<https://youtu.be/NKMHhm2Zbkw>)

Winther, Greg (2019) Implementing a SIR Disease model in Python. Accessed 9 April 2020. <https://youtu.be/mwJXjMTwAw> (<https://youtu.be/mwJXjMTwAw>)

In [2]: 1 hack.SIR\_model\_UI()

Social distancing  0.30  
Days Contagious  14.00



## Decisions Based on What's Going on in my Neighborhood

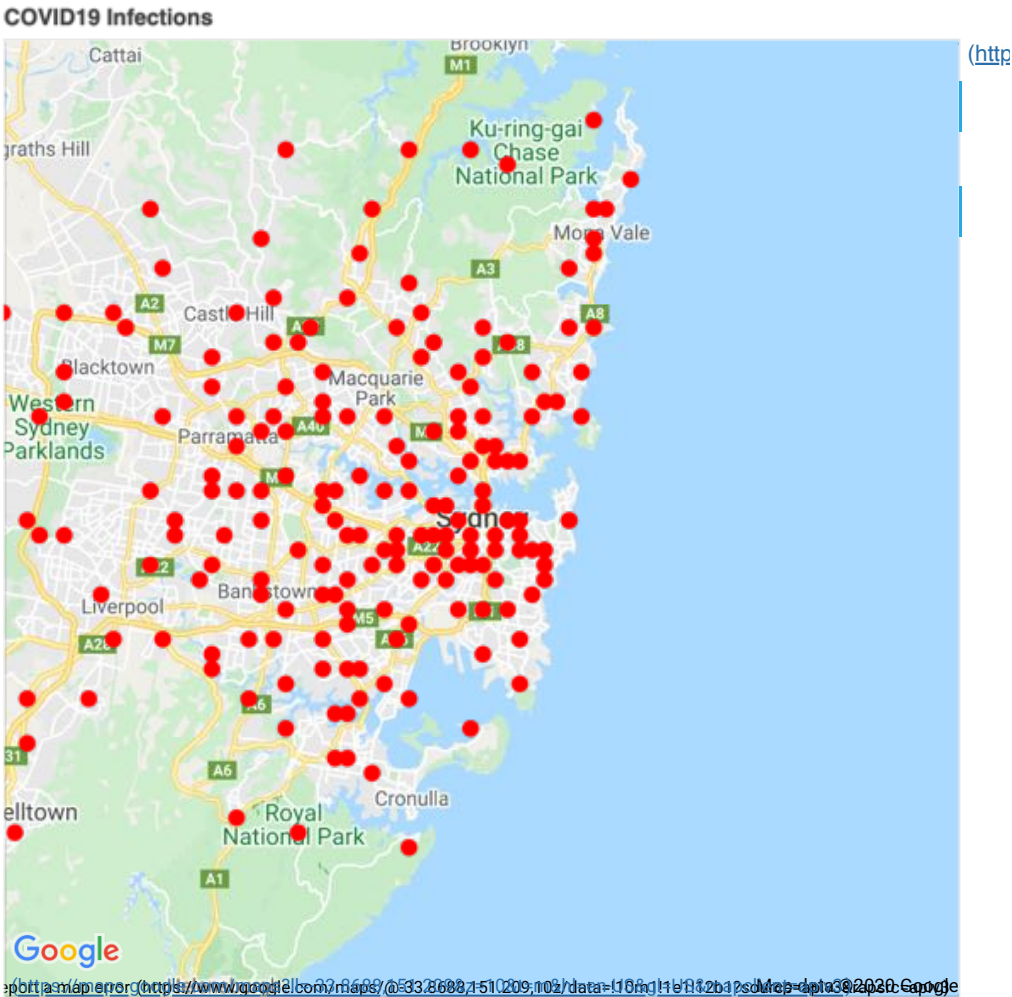
Having access to information helps me to make informed decisions.

Using the data from the map below, consider these questions and their impact on your behavior:

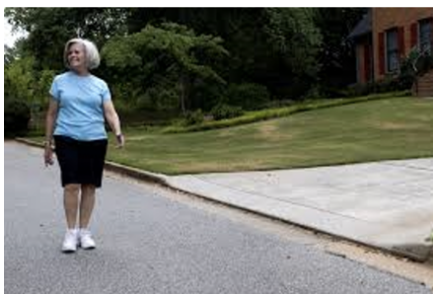
- If my area has a large number of cases, what actions should I take to safeguard myself and my family?
- If my area has relatively few cases, what can I do to keep it that way?

In [3]:

1 hack.mapData()



## Personal Stories and Strategies



### 1.5 Meters of Distance

Amy is an avid hiker. Hiking not only provides exercise, but getting close to nature helps her manage stress and keeps things in perspective. Social distancing is impossible on a narrow trail when passing other hikers. Amy will commit to walking in her neighborhood instead where she can stay 1.5 feet from others on the path.

**Resource:** <https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/how-to-protect-yourself-and-others-from-coronavirus-covid-19/social-distancing-for-coronavirus-covid-19>  
(<https://www.health.gov.au/news/health-alerts/novel-coronavirus-2019-ncov-health-alert/how-to-protect-yourself-and-others-from-coronavirus-covid-19/social-distancing-for-coronavirus-covid-19>)

**Image:** [www.pixnio.com](http://www.pixnio.com) (<http://www.pixnio.com>)



### Do Not Gather

Mary is a teenager. She enjoys spending time with her friends. They often go to the mall or hang out and listen to music. During quarantine Mary does not gather with friends, so instead she meets with them remotely on the internet or telephone.

**Resource:** <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html> (<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/social-distancing.html>)

**Image:** [www.pixabay.com](http://www.pixabay.com) (<http://www.pixabay.com>)



### Wash Hands

Kalinda is a single mother of three children. They live in a rural community. The community has been quarantined and open only to community residents in order to reduce Sars CoV 2 transmission from outside. There are nurses and small medical clinics available in this area but doctors are available mostly using telemedicine options. A severe COVID-19 illness would require air transport to a hospital. Kalinda teaches her children how to properly wash their

hands.

**Resource:** [https://coronavirus.tas.gov.au/\\_data/assets/pdf\\_file/0035/86759/Hand\\_Washing\\_Procedure\\_-\\_COVID-19\\_Fact\\_Sheet.pdf](https://coronavirus.tas.gov.au/_data/assets/pdf_file/0035/86759/Hand_Washing_Procedure_-_COVID-19_Fact_Sheet.pdf) ([https://coronavirus.tas.gov.au/\\_data/assets/pdf\\_file/0035/86759/Hand\\_Washing\\_Procedure\\_-\\_COVID-19\\_Fact\\_Sheet.pdf](https://coronavirus.tas.gov.au/_data/assets/pdf_file/0035/86759/Hand_Washing_Procedure_-_COVID-19_Fact_Sheet.pdf))

**Image:** [www.pixnio.com](http://www.pixnio.com) (<http://www.pixnio.com>)





### Face Mask

Joe is taking care of his elderly mother, Mae. Since Mae is at an age with increased risk for COVID-19 serious illness, it is important that he doesn't expose her to the virus. While out doing essential errands like shopping for food, wearing a face mask will help reduce the risk of Sars CoV 2 exposure. Joe makes his own face

mask to cover his nose and mouth while out running essential errands.

**Resource:** <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>  
(<https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/diy-cloth-face-coverings.html>)



### Wash and Disinfect Surfaces

Caleb is an essential worker. His partner, Wayne, has COPD. Wayne's lung condition increases his risk of severe illness with COVID-19. Caleb and Wayne regularly wash and disinfect surfaces, door knobs and other frequently touched surfaces in their home.

**Resource:** [https://coronavirus.tas.gov.au/\\_data/assets/pdf\\_file/0035/86759/Hand\\_Washing\\_Procedure\\_-\\_COVID-19\\_Fact\\_Sheet.pdf](https://coronavirus.tas.gov.au/_data/assets/pdf_file/0035/86759/Hand_Washing_Procedure_-_COVID-19_Fact_Sheet.pdf) ([https://coronavirus.tas.gov.au/\\_data/assets/pdf\\_file/0035/86759/Hand\\_Washing\\_Procedure\\_-\\_COVID-19\\_Fact\\_Sheet.pdf](https://coronavirus.tas.gov.au/_data/assets/pdf_file/0035/86759/Hand_Washing_Procedure_-_COVID-19_Fact_Sheet.pdf))

**Image:** [www.pixnio.com](http://www.pixnio.com) (<http://www.pixnio.com>)



### Keep a Supply of Food and Medicine

Blake has diabetes and high blood pressure. His health conditions increase his risk of respiratory complications due to COVID 19. Blake is keeping a 2-week food supply and 30 days of medication on hand to minimize his essential trips to the market and pharmacy. When he must make essential trips for food and medication, he wears a mask over his nose and mouth.

**Resource:** <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/essential-goods-services.html> (<https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/essential-goods-services.html>)

**Image:** [www.publicdomainfiles.com](http://www.publicdomainfiles.com)  
(<http://www.publicdomainfiles.com>)



## Make a Plan

Andrea is a young professional. She lives close to her parents who are retired, and to her cousins who are essential workers. During the quarantine, Andrea is able to remotely work from home.

Andrea, her parents, and her cousins have a family plan. The family plan is made in case one of the households become ill with the COVID-19 virus. This plan details how this family network will safely supply groceries, supplies and medication to the infected household as well as who will provide care to sick individuals.

**Resources:** <https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/get-your-household-ready-for-COVID-19.html> (<https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/get-your-household-ready-for-COVID-19.html>)

**Image:** [www.commonswikimedia.org](http://www.commonswikimedia.org) (<http://www.commonswikimedia.org>)



## Stay Home

Martha is a successful entrepreneur. She has a comfortable life in the city and a country home. She enjoys frequent vacations. She would like to travel now, but stays home to stop the spread of COVID-19.

**Resource:** <https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-social-distancing-and-self-quarantine> (<https://www.hopkinsmedicine.org/health/conditions-and-diseases/coronavirus/coronavirus-social-distancing-and-self-quarantine>)

**Image:** [www.commonswikimedia.org](http://www.commonswikimedia.org) (<http://www.commonswikimedia.org>)



## Manage Stress

Kenneth is a nonessential gig worker. Quarantine has impacted his income. Ken is stressed about the COVID-19 epidemic. To minimize anxiety, Ken takes breaks from the news, meditates regularly, eats a healthy diet and gets physical activity daily.

**Resource:** <https://nutrition.org/making-health-and-nutrition-a-priority-during-the-coronavirus-covid-19-pandemic/> (<https://nutrition.org/making-health-and-nutrition-a-priority-during-the-coronavirus-covid-19-pandemic/>)

**Image:** [www.pixnio.com](http://www.pixnio.com) (<http://www.pixnio.com>)



### Stay Away from Others When Sick

Jared is sick. He has a cough, shortness of breath, and a fever. When he coughs he coughs into his elbow. He stays at home and away from other people, and he calls his doctor.

**Resource:** <https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html> (<https://www.cdc.gov/coronavirus/2019-ncov/if-you-are-sick/steps-when-sick.html>)

**Image:** [www.commons.wilimedia.org](http://www.commons.wilimedia.org) (<http://www.commons.wilimedia.org>)

## My Personal Strategy to Flatten the Curve

Take the pledge to flatten the curve and share your personal strategy for flattening the curve with others.

In [4]:

1 hack.commitmentUI()

Name (optional)

Location (optional)

- ☐ I will commit to keeping a 1.5 meter distance from others to Flatten the Curve.
- ☐ I will commit to frequent hand washing to Flatten the Curve.
- ☐ I will commit to wearing a face mask while doing essential errands to Flatten the Curve.
- ☐ I will commit to regular cleaning of frequently touched surfaes to Flatten the Curve.
- ☐ I will commit to minimising essential errand frequency to Flatten the Curve.
- ☐ I will make a plan to Flatten the Curve.
- ☐ I will commit to staying home to Flatten the Curve.
- ☐ I will commit to stress management to Flatten the Curve.
- ☐ If I should become ill, I will stay at home and contact my physician to Flatten the Curve.

My Personal Strategy for Flattenting the Curve:

Submit

## Strategies Shared by the Community

See what strategies have been suggested by others who have visited this site



In [5]:

1

hack.communityUI( )

**James from Ascot writes:**

I've been taking our dog Oscar for a walk early in the morning to avoid crowds on the path. It's great to spend time o

**Glenn from Maylands writes:**

I used to have my friends around for "Games Night" from time to time. Lately I've hosted two online games nights for we can see each other, and to share the "Game Board". The software we've been using lets each of us enter our per

# Acknowledgments

Thank You to the Australian Computer Society and sponsors of the hachathon, and in particular our coaches:

- Arnold Wong FACS CP
- Matthew Moore