

Singapore's Health Readiness for the Future

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Introduction to Programming for Data Science

Specialist Diploma in Data Analytics (Data Science)

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- ▶ Most common causes of death in Singapore (Grouped bar plot)
- ▶ Deep dive into cancer, ischaemic heart disease and stroke (Line plot)
- ▶ Healthcare professionals (Grouped bar plot)
- ▶ Polyclinic attendance (Stacked bar plot & pie chart)
- ▶ Public hospital admissions (Histogram)
- ▶ Government health expenditure (Line plot & Plotly animation)
- ▶ Medisave balances (Scatter plot)
- ▶ Insurance coverage (Line plot)

URLs of datasets

- ▶ Age-Standardised Mortality Rate for Cancer
https://beta.data.gov.sg/collections/518/datasets/d_75673c9d6c4efdc08530b55e6003976/view
- ▶ Age-Standardised Mortality Rate for Ischaemic Heart Disease
https://beta.data.gov.sg/collections/518/datasets/d_d97c49f8f6ae5c9102a5598766718340/view
- ▶ Age-Standardised Mortality Rate for Stroke
https://beta.data.gov.sg/collections/518/datasets/d_e3f0c53137e5ee11b6df121ec4987bb7/view
- ▶ Medisave Accounts and Balances, Annual
https://beta.data.gov.sg/datasets?topics=health&resultId=d_2ed23324aeac97609c4e16299ab05ffc
- ▶ Principal Causes of Death https://beta.data.gov.sg/datasets?topics=health&resultId=d_48143a2b16027afcadeb362352b0266a
- ▶ Hospital Admissions By Sector, Annual
https://beta.data.gov.sg/datasets?topics=health&resultId=d_a22337386e9598a83026564c73d2881d
- ▶ Top 4 Conditions of Polyclinic Attendances
https://beta.data.gov.sg/datasets?topics=health&resultId=d_a1ab62d65ae87130925c1f52a1d0c79d
- ▶ Number of Policyholders for MediShield and Integrated Shield Plans, Annual
https://beta.data.gov.sg/datasets?topics=health&resultId=d_a9acac29f36a10e43d4b14a793685c77
- ▶ Number of Graduates in Healthcare Specialisations by Course
https://beta.data.gov.sg/datasets?topics=health&resultId=d_943ba9a3d9b1e0e89ea5cbf8c58c94da
- ▶ Government Total Expenditure
https://beta.data.gov.sg/datasets?topics=economy&query=government+expenditure&resultId=d_00f95040967791729d51bd7cd6af2355

Singapore's Health Readiness for the Future

- ▶ To assess Singapore's readiness to face the healthcare challenges in the future, we need to gain insights from healthcare data by asking a few important questions:
 - ▶ Which are the most common diseases that we need to tackle?
 - ▶ Are there enough manpower & facilities to cater to healthcare demands?
 - ▶ Does the government have enough financial reserves to maintain healthcare services?
 - ▶ Do Singaporeans have enough Medisave & insurance coverage to pay for healthcare services?

Which are the most common diseases that we need to tackle?

Most common causes of death in Singapore

- ▶ Principal Causes of Death dataset consists of:
- ▶ 6 columns
- ▶ 172 rows

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 172 entries, 0 to 171
```

```
Data columns (total 6 columns):
```

#	Column	Non-Null Count	Dtype
---	-----	-----	-----
0	year	172 non-null	int64
1	rank	172 non-null	int64
2	icd	172 non-null	object
3	classification	172 non-null	object
4	disease_condition	172 non-null	object
5	percentage_deaths	172 non-null	float64

```
dtypes: float64(1), int64(2), object(3)
```

```
memory usage: 8.2+ KB
```

Most common causes of death in Singapore

- Years range from 2006 to 2022
- 11 categories of heart diseases

*** Column Unique Values ***

year values: [2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022]

rank values: [1 2 3 4 5 6 7 8 9 10]

icd values: ['ICD9' 'ICD10']

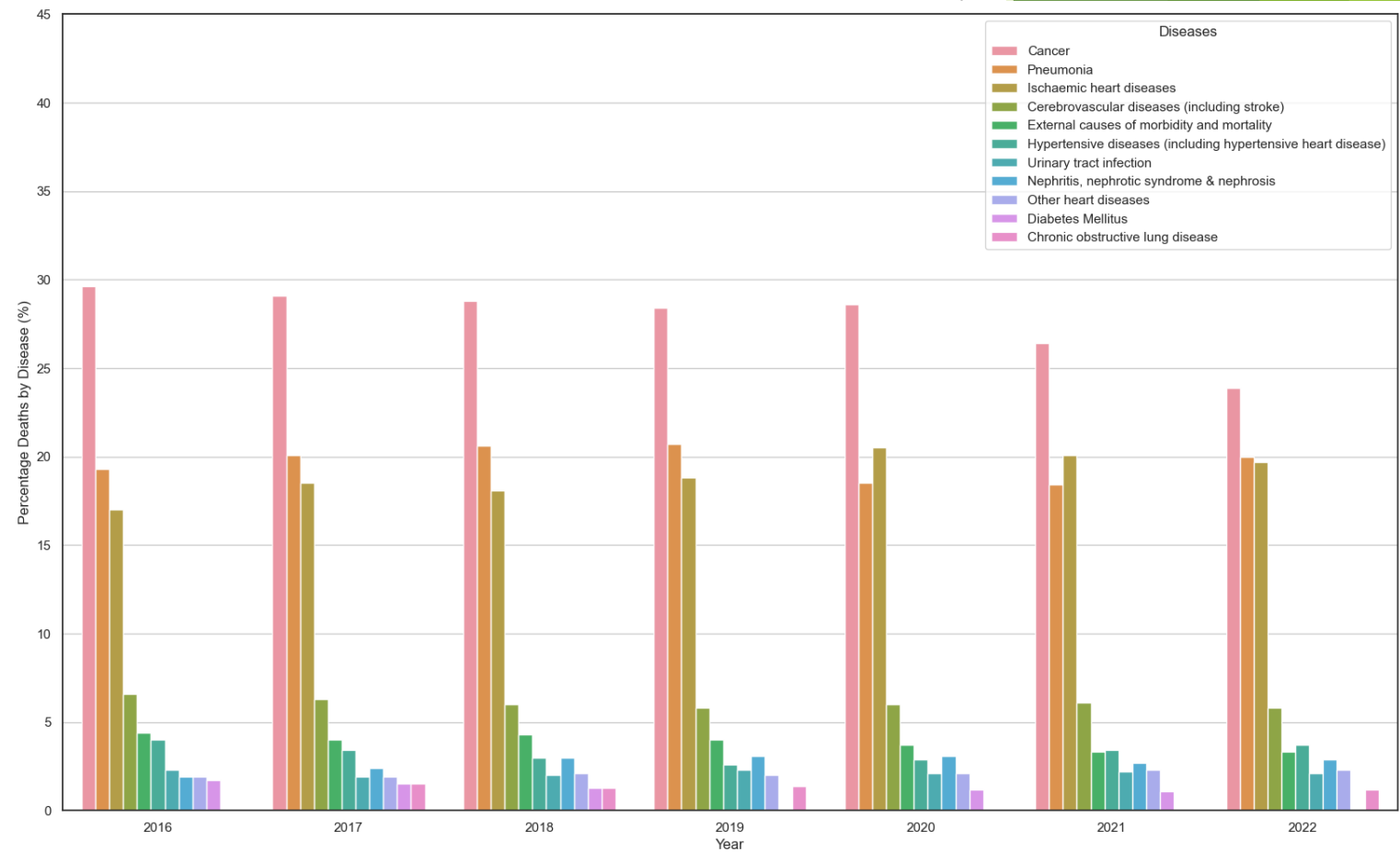
classification values: ['140-208' '410-414' '480-486' '430-438' 'E800-E999' '393-398, 402, 415-429' '250' '490-493, 496' '599' '580-589' 'C00-C97' 'J12-J18' 'I20-I25' 'I60-I69' 'V01-Y89' 'I10-I15' 'N00-N07, N17-N19, N25-N27' 'N39.0' 'J40-J44' 'I00-I09, I26-I51' 'E10-E14' 'JE10-E14']

disease_condition values: ['Cancer' 'Ischaemic Heart Disease' 'Pneumonia' 'Cerebrovascular Disease (including stroke)' 'Accidents, Poisoning & Violence' 'Other Heart Diseases' 'Diabetes Mellitus' 'Chronic Obstructive Lung Disease' 'Urinary Tract Infection' 'Nephritis, Nephrotic Syndrome & Nephrosis' 'Ischaemic heart diseases' 'Cerebrovascular diseases (including stroke)' 'External causes of morbidity and mortality' 'Hypertensive diseases (including hypertensive heart disease)' 'Nephritis, nephrotic syndrome & nephrosis' 'Urinary tract infection' 'Chronic obstructive lung disease' 'Other heart diseases']

percentage_deaths values: [28.5 18.5 13.7 8.9 6.3 4.3 3.3 2. 1.7 27.7 19.8 13.9 8.7 6. 3.6 2.6 2.2 29.3 20.1 8.3 5.8 4. 2.7 2.5 2.1 19.2 15.3 8. 5.7 4.4 2.4 2.3 18.7 15.7 8.4 5.5 4.8 1. 30. 16.4 16. 9. 5. 30.1 16.8 16.1 9.3 5.6 2.8 1.9 30.5 15.5 4.9 3.1 1.6 29.4 19. 4.7 1.8 29.7 19.4 16.7 6.8 4.5 3.9 29.6 19.3 17. 6.6 29.1 3.4 1.5 28.8 20.6 18.1 3. 1.3 28.4 20.7 18.8 1.4 28.6 20.5 3.7 2.9 1.2 26.4 18.4 6.1 1.1 23.9 20. 19.7]

Most common causes of death in Singapore

- ▶ The top 3 most common causes of death in Singapore are: cancer, pneumonia, ischaemic heart disease
- ▶ They contribute between 17% to 29% of death per disease annually
- ▶ Deaths due to cancer has been dropping, from 29% in 2016 to 24% in 2022. This may be due to advances in cancer treatment
- ▶ However, pneumonia and ischaemic heart diseases have been contributing to the same proportion of deaths year on year, between 17% to 20%
- ▶ Cerebrovascular diseases, including stroke, comes 4th



Deep dive into cancer, ischaemic heart disease, stroke

- ▶ All 3 datasets have 30 rows, 2 columns
- ▶ Years range from 1990 to 2019

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0   year    30 non-null         int64
1   stroke  30 non-null         float64
dtypes: float64(1), int64(1)
memory usage: 612.0 bytes
```

```
*** Column Unique Values ***
```

```
year values: [1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
2018 2019]
```

```
stroke values: [95.8 95.5 83.7 83.1 81.2 78.2 74.7 66.7 61.4 55.3 53.4 44.4 42.2 41.7
40.8 37.3 32.9 30.8 30.2 26.3 28.1 28.2 28.9 25.4 23.5 19.9 19.6 18.4
18.2 16.4]
```

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0   year    30 non-null         int64
1   cancer  30 non-null         float64
dtypes: float64(1), int64(1)
memory usage: 612.0 bytes
```

```
*** Column Unique Values ***
```

```
year values: [1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
2018 2019]
```

```
cancer values: [244.5 241.  240.8 231.8 240.7 230.8 227.2 223.  218.5 207.3 199.6 204.2
198.6 184.9 180.1 169.3 170.  165.2 157.6 153.2 157.5 154.9 155.1 143.9
141.9 135.9 134.2 130.9 122.2]
```

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 30 entries, 0 to 29
Data columns (total 2 columns):
#   Column  Non-Null Count  Dtype
---  -
0   year    30 non-null         int64
1   ihd     30 non-null         float64
dtypes: float64(1), int64(1)
memory usage: 612.0 bytes
```

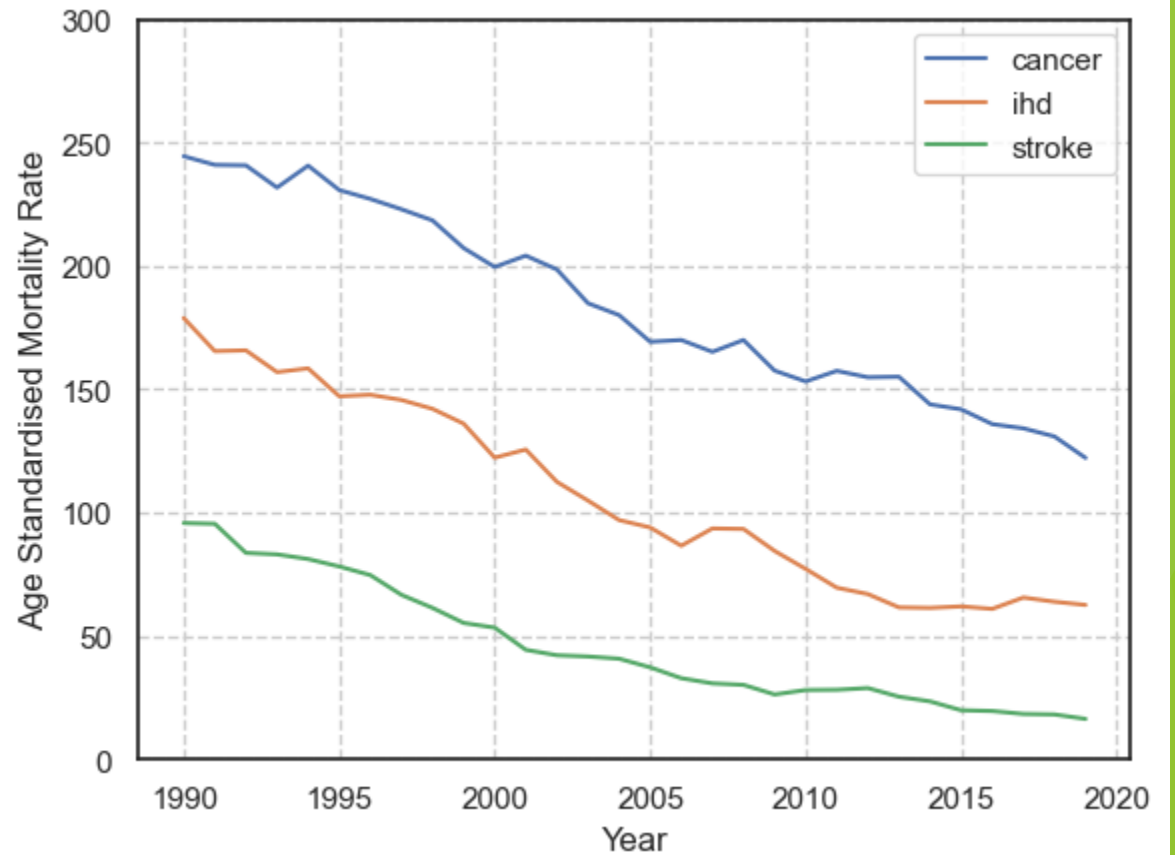
```
*** Column Unique Values ***
```

```
year values: [1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003
2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017
2018 2019]
```

```
ihd values: [178.9 165.5 165.8 157.  158.5 147.2 147.8 145.7 142.1 136.1 122.3 125.6
112.5 104.9 97.  94.  86.6 93.6 93.4 84.5 77.2 69.6 67.  61.6
61.4 62.  61.  65.6 63.9 62.6]
```

Deep dive into cancer, ischaemic heart disease, stroke

- ▶ All 3 common causes of death have their age standardised mortality rate decrease linearly over the years, ranging between 75 to 125 units, since 1990 until 2019
- ▶ This means that the quality of healthcare services has been improving



Deep dive into cancer, ischaemic heart disease, stroke

- It is reported clearly in the news that cardiovascular disease is the leading cause of death for women
- Cancer treatment options are still expanding till date

THE STRAITS TIMES

SINGAPORE

LOG

Singapore patients may get greater access to novel cancer drugs under R&D partnership



A panel discussion on optimising collaborative efforts in cancer research moderated by Dr Anand Jeyasekharan (left). The other panellists are (second from left) Professor Chng Wee Joo, Mr Ira Mellman and Associate Professor Daniel Tan. ST PHOTO: KEVIN LIM



Zhaki Abdullah

UPDATED JUL 25, 2024, 07:16 AM

f

THE STRAITS TIMES

LIFE

LOG

Cardiovascular disease the leading cause of death for women in Singapore last year



Besides just exercise, part of Madam Kirti Harnal's rehab also involves teaching her how to control her stress and heart rate. ST PHOTO: DESMOND WEE



Amrita Kaur

UPDATED JUN 16, 2021, 04:31 PM

f

Are there enough manpower
& facilities to cater to
healthcare demands?

Healthcare Professionals

- ▶ 94 rows, 3 columns in dataset
- ▶ Dropped a row with missing data on graduates

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 94 entries, 0 to 95
Data columns (total 3 columns):
#   Column             Non-Null Count  Dtype
---  -
0   year                94 non-null    int64
1   graduate_type       94 non-null    object
2   no_of_graduates     94 non-null    int64
dtypes: int64(2), object(1)
memory usage: 2.9+ KB
```

```
*** Column Unique Values ***
```

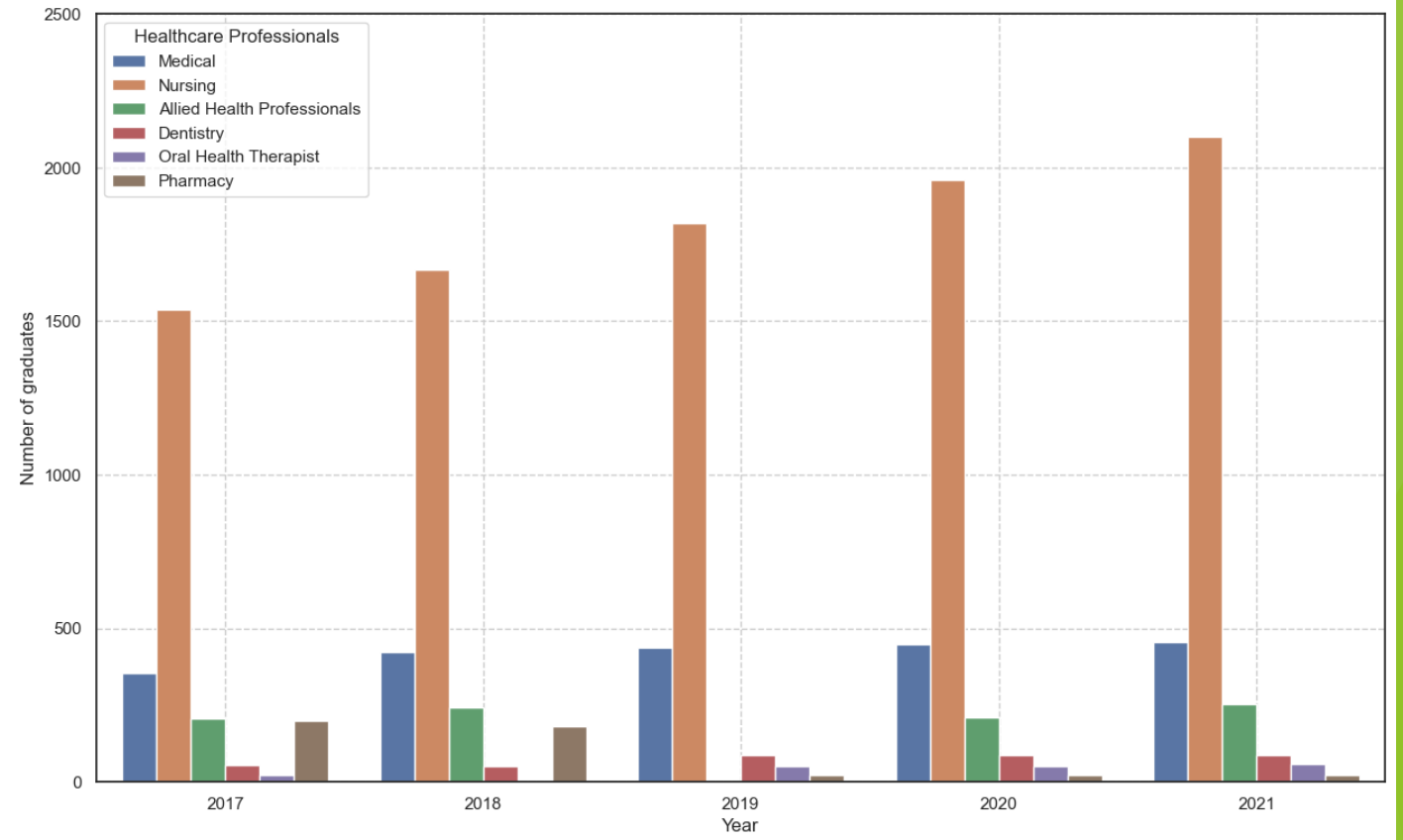
```
year values: [2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019
2020 2021]
```

```
graduate_type values: ['Medical' 'Nursing' 'Allied Health Professionals' 'Dentistry' 'Pharmacy'
'Oral Health Therapist']
```

```
no_of_graduates values: [ 229 1140  115   30   81  227 1446  188   36   86 1538  151   35   22
   87  219 1523  124   31   15   98  228 1619  141   43   21  118  279
 1665  163   42  107  290 1744  257  123  303 1641  206   48  138  312
 1564  222   45  302 1479   51   17  150  328 1558  210   57   23  165
  353 1536   56   24  198  423 1668  241   52    0  183  437 1818   89
 448 1958  456 2102  252   58]
```

Healthcare Professionals

- ▶ Looking only at the recent few years, the number of graduates from the different healthcare professions have been steadily increasing, which is a healthy sign that the schools are expanding their intakes to prepare for the future
- ▶ Number of medical graduates annually maintain close to 500, while nursing has been steadily increasing linearly, breaking past 2000 annually in 2021
- ▶ Note: missing data for allied health professionals in 2019



Healthcare Professionals

- More and more job opportunities will be created in the healthcare sector to tackle the issue of ageing population

THE STRAITS TIMES

SINGAPORE

LOG

7,500 jobs and 1,600 training opportunities in healthcare sector to be created by end-2021



Of the 7,500 job opportunities in healthcare, about one-third are for healthcare professionals, including nurses and allied health professionals. ST PHOTO: LIM YACHUI



Prisca Ang
Business Correspondent

UPDATED AUG 28, 2020, 03:04 PM



Polyclinic attendance

- ▶ 64 rows, 3 columns
- ▶ Years from 2006 to 2021
- ▶ 4 main health conditions

```
*** Dataframe info ***
```

```
<class 'pandas.core.frame.DataFrame'>
```

```
RangeIndex: 64 entries, 0 to 63
```

```
Data columns (total 3 columns):
```

#	Column	Non-Null Count	Dtype
0	year	64 non-null	int64
1	condition	64 non-null	object
2	percentage_diagnoses	64 non-null	float64

```
dtypes: float64(1), int64(1), object(1)
```

```
memory usage: 1.6+ KB
```

```
*** Column Unique Values ***
```

```
year values: [2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019  
2020 2021]
```

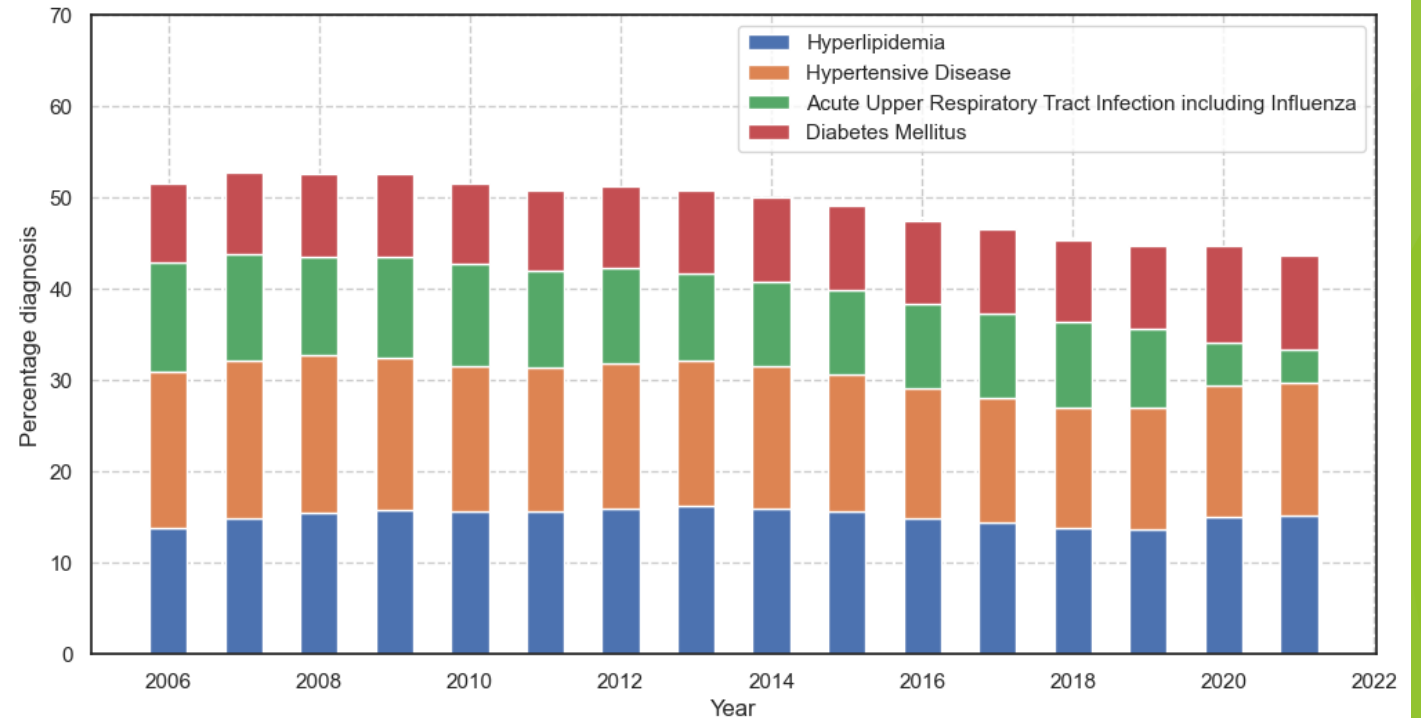
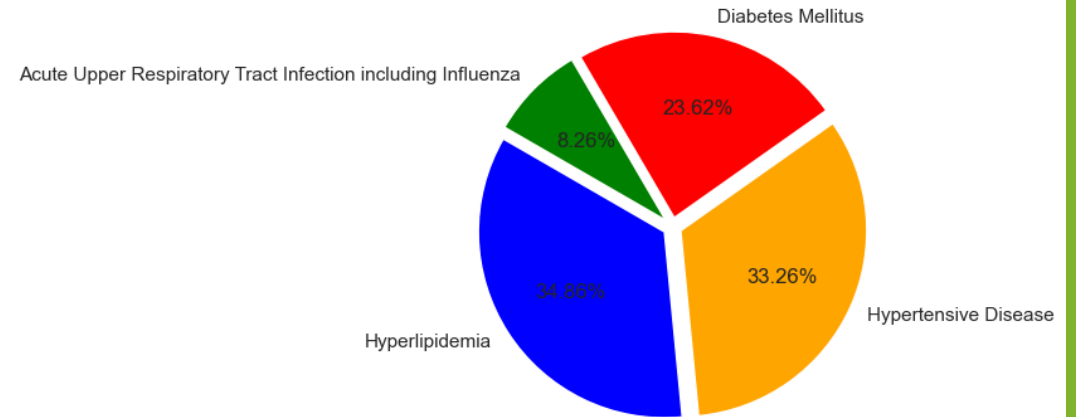
```
condition values: ['Hyperlipidemia' 'Hypertensive Disease'  
'Acute Upper Respiratory Tract Infection including Influenza'  
'Diabetes Mellitus']
```

```
percentage_diagnoses values: [13.8 17.2 11.9  8.6 14.9 17.3 11.6  9.  15.5 10.8  9.1 15.8 16.6 11.1  
15.6 15.9 11.2  8.9 15.7 10.6  8.8 16.  10.5 16.2  9.6  9.2 15.  9.3  
14.2 14.4 13.7 13.2  9.4 13.3 15.1  4.7 15.2 14.5 10.3  3.6]
```


Polyclinic attendance

- ▶ Over the recent years, the polyclinic has seen a decrease in acute URTI visitations, entertaining mostly chronic illness patients
- ▶ This is a good sign as it shows sustainability in polyclinics' ability to handle long-term outpatient visits in the long run
- ▶ The other possible reason is that more are seeking treatment from the GP clinics, which are not shown in this data

Polyclinic attendance for 4 major illnesses in 2021



Public Hospital Admissions

- ▶ 222 rows, 4 columns
- ▶ Acute, Psychiatric and Community hospitals admission
- ▶ Public & non-public

*** Dataframe info ***

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 222 entries, 0 to 221  
Data columns (total 4 columns):  
#   Column      Non-Null Count  Dtype  
---  -  
0   year        222 non-null    int64  
1   level_1     222 non-null    object  
2   level_2     222 non-null    object  
3   value       222 non-null    object  
dtypes: int64(1), object(3)  
memory usage: 7.1+ KB
```

*** Column Unique Values ***

```
year values: [1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997  
1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011  
2012 2013 2014 2015 2016 2017 2018 2019 2020]
```

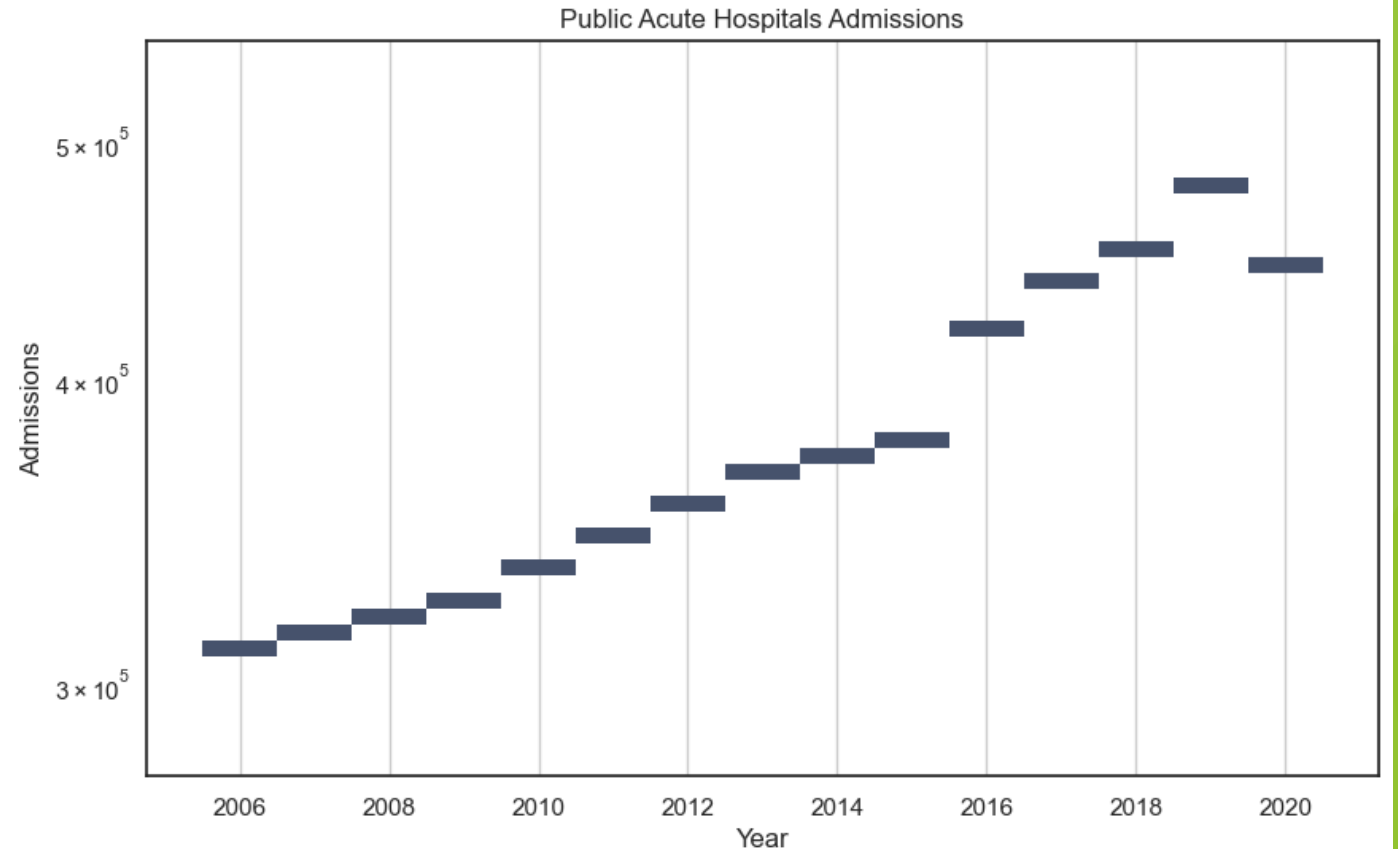
```
level_1 values: ['Acute Hospitals Admissions' 'Psychiatric Hospitals Admissions'  
'Community Hospitals Admissions']
```

```
level_2 values: ['Public' 'Non-public']
```

```
value values: ['na' '308016' '92620' '8245' '269' '0' '6229' '317355' '95850' '8417'  
'288' '7312' '321187' '91013' '8884' '7013' '323535' '90057' '9060'  
'7612' '333573' '93732' '9759' '7534' '347398' '98986' '9628' '572'  
'7107' '354076' '105826' '8382' '688' '7063' '364911' '109282' '8110'  
'1053' '7649' '372661' '116913' '9050' '1467' '7600' '379973' '119916'  
'8986' '2187' '8483' '416663' '129593' '9028' '5432' '8449' '436882'  
'131235' '9316' '7361' '8994' '455272' '129547' '9215' '8271' '483939'  
'134197' '9234' '10215' '9828' '444863' '111648' '8426' '11169' '9679']
```

Public Hospital Admissions

- ▶ Since 2006, public acute hospital admissions has been increasing drastically from 300k to almost 500k in 2020
- ▶ This is a worrying trend as it means much longer waiting times, unless these increases are linearly proportionate to the increase in newly-built and adequately manned hospitals
- ▶ The drop in 2020 maybe due to COVID-19



Public Hospital Admissions

THE STRAITS TIMES

SINGAPORE

LOG

75% of hospital admissions for medical emergencies, uncontrolled chronic conditions: Kenneth Mak



Associate Professor Kenneth Mak said about 20 per cent of the cases were diagnosed with the coronavirus at the point of admission. ST PHOTO: FELINE LIM



Cheryl Tan
Correspondent

UPDATED MAR 11, 2022, 10:20 PM

f ↩ ...

SINGAPORE - Hospitals are seeing fewer admissions for Covid-19, and about 75 per cent of cases are for medical emergencies and uncontrolled chronic medical conditions, said Singapore's director of medical services Kenneth Mak.

THE STRAITS TIMES

SINGAPORE

LOG

Longer wait for admission with most public hospitals seeing more A&E patients, Covid-19 cases



MOH had earlier urged those with mild acute respiratory infection symptoms to avoid seeking treatment in hospitals. ST PHOTO: KHALID BABA



Ng Keng Gene
Correspondent

UPDATED SEP 21, 2021, 09:50 AM

f ↩ ...

SINGAPORE - Some patients requiring admission have had to wait longer for beds, with most emergency departments (EDs) at public hospitals kept busier in the past week compared with the month before, said the Ministry of Health (MOH) on Monday (Sept 20).

The EDs are also seeing a higher number of Covid-19 cases, with more beds diverted to meet their needs, a spokesman told The Straits Times.

SINGAPORE

LOG

Initiatives to tackle frequent hospital admissions see results



CareHub, an initiative started by the National University Health System, proved to be a success in a pilot conducted from July to November 2016 that involved 270 heart failure patients from the NUH Heart Centre. PHOTO: LIANHE ZAOBAO



Yuen Sin
Political Correspondent

UPDATED MAR 10, 2019, 08:15 PM

f ↩ ...

SINGAPORE - Efforts to integrate community health and social services for those who are at risk of hospital re-admission have grown in recent years.

Does the government have
enough financial reserves to
maintain healthcare services?

Government Health Expenditure

- ▶ 1120 rows, 7 columns
- ▶ All the different ministries in the government
- ▶ Development & operating expenditures

*** Dataframe info ***

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 1120 entries, 0 to 1119  
Data columns (total 7 columns):  
#   Column                Non-Null Count  Dtype    
---  ---                  
0   financial_year         1120 non-null   int64    
1   actual_revised_estimated 1120 non-null   object   
2   sector                 1120 non-null   object   
3   ministry               1120 non-null   object   
4   type                   1120 non-null   object   
5   amount                 1120 non-null   int64    
6   percent_of_gdp         1120 non-null   float64  
dtypes: float64(1), int64(2), object(4)  
memory usage: 61.4+ KB
```

*** Column Unique Values ***

financial_year values: [1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024]

actual_revised_estimated values: ['Actual' 'Revised' 'Estimated']

sector values: ['Economic Development' 'Government Administration' 'Security and External Relations' 'Social Development']

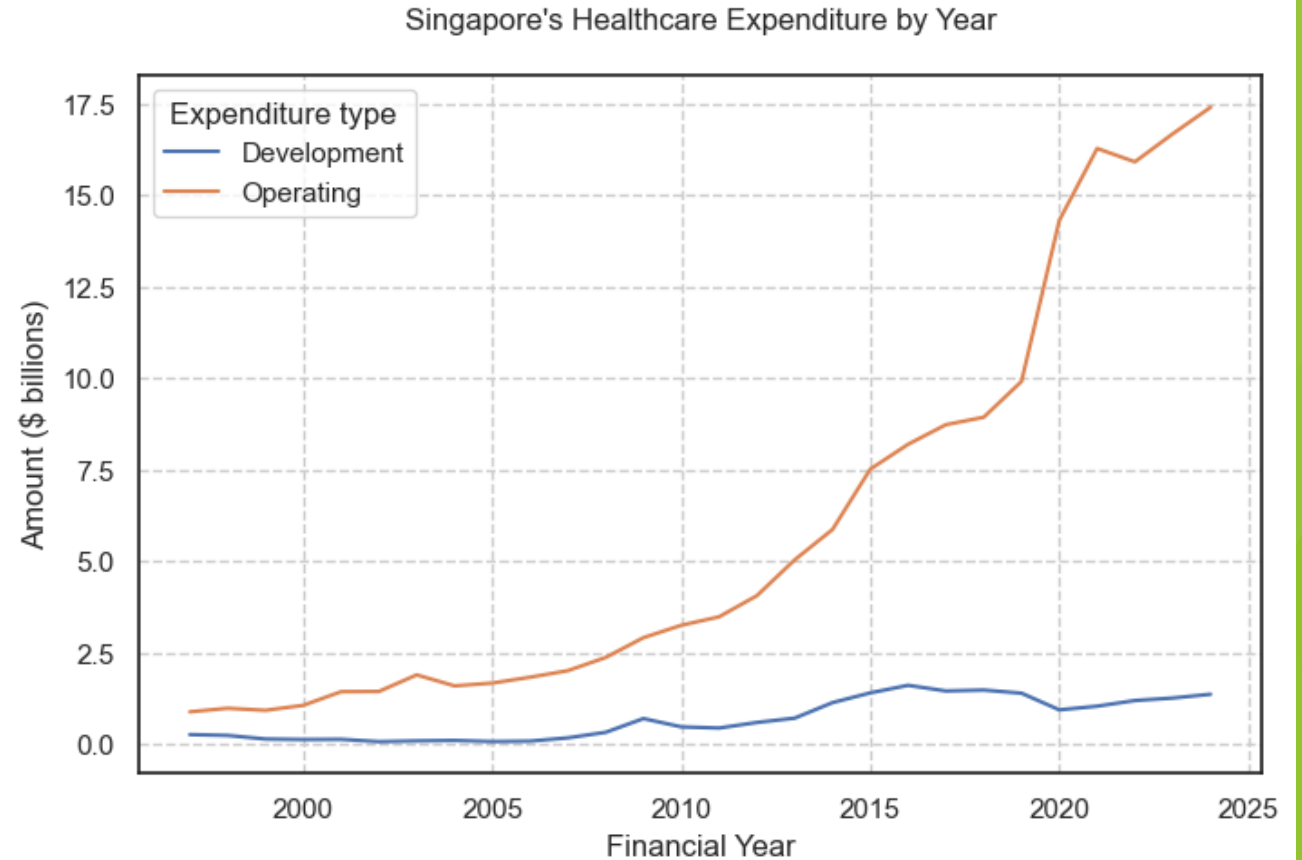
ministry values: ['Info-Communications and Media Development' 'Manpower' 'Trade and Industry' 'Transport' 'Communications and Information' 'Finance' 'Law' 'Organs of State' 'Prime Minister's Office' 'Defence' 'Foreign Affairs' 'Home Affairs' 'Culture, Community and Youth' 'Education' 'Health' 'National Development' 'Social and Family Development' 'Sustainability and the Environment']

type values: ['Development' 'Operating']

amount values: [39 94 82 179 23 5 25 33 46 28 48 38
525 278 126 68 296 153 105 4 8 29 53 17
37 0 24 47 42 34 76 88 160 227 267 378
454 490 617 535 731 765 855 1104 836 12 6 18
54 52 36 15 35 22 62 21 65 79 85 127]

Government Health Expenditure

- ▶ The worrying trend is that the government's health expenditure has been increasing at an exponential rate, from \$2 billion in 2000 to almost estimated \$19 billion in 2024
- ▶ This is not sustainable in the long run, as the government revenue has to go up, either through taxes or other means



Government Health Expenditure

- ▶ GST is one of the tax measures as announced by the government that is increased in order to fund healthcare expenditure

THE STRAITS TIMES

SINGAPORE

LOG

Budget debate: GST rate needs to go up because of necessary and unavoidable spending on healthcare, says Lawrence Wong



The spending is driven by Singapore's rapidly ageing population, where more seniors will live longer lives and require more medical care. ST PHOTO: FELINE LIM

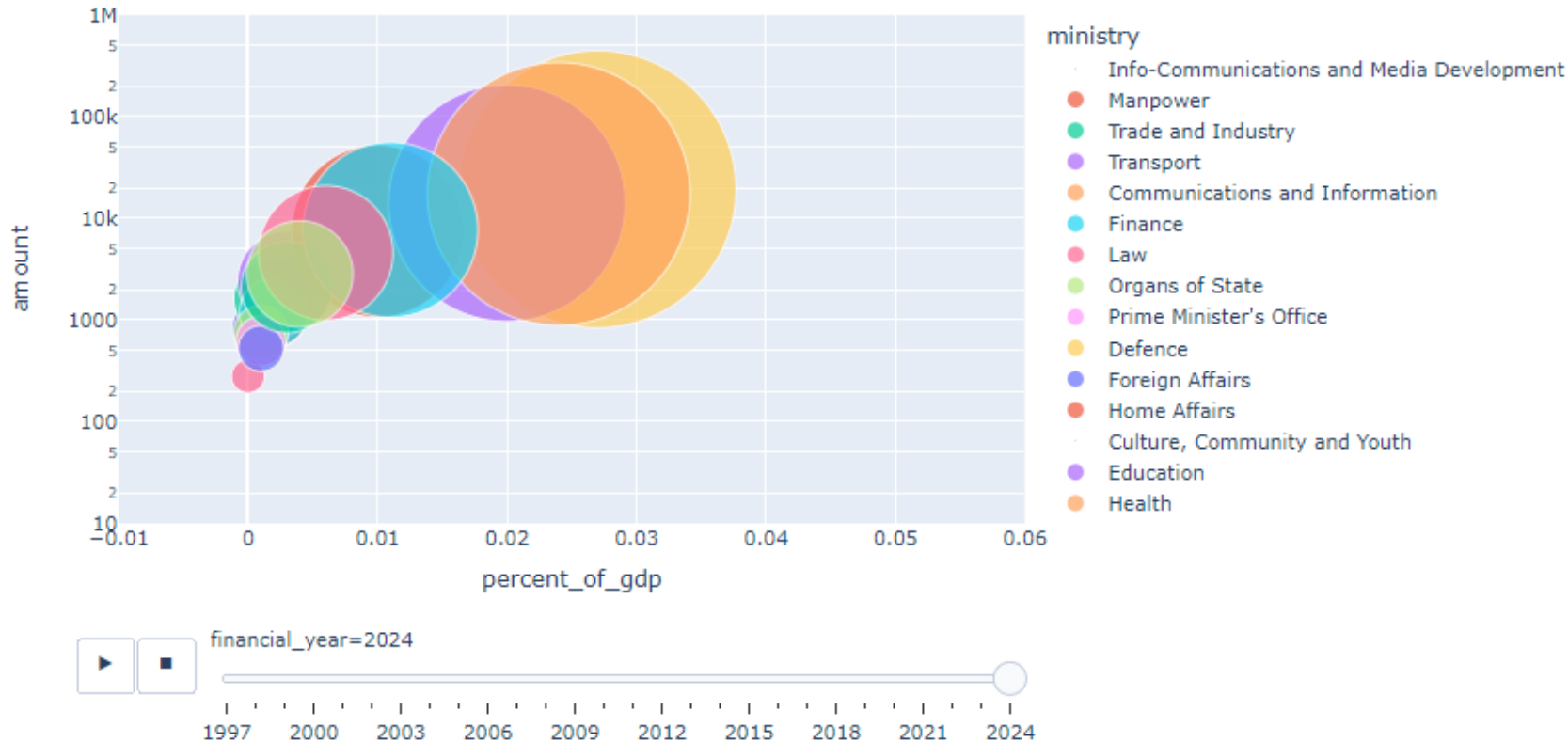


Linette Lai
Health Correspondent

UPDATED MAR 02, 2022, 11:14 PM

Government Health Expenditure

- Watch this animation on Jupyter notebook to see how the Singapore's health expenditure has ballooned rapidly over the years



The background features abstract, overlapping green geometric shapes, primarily triangles and polygons, in various shades of green, creating a modern, layered effect on the right side of the slide.

Do Singaporeans have enough
Medisave & insurance
coverage to pay for
healthcare services?

Medisave Balances

- ▶ 16 rows, 5 columns
- ▶ Years from 2006 to 2021
- ▶ Number of accounts, total balance, average balance and amount withdrawn

*** Dataframe info ***

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 16 entries, 0 to 15  
Data columns (total 5 columns):  
#   Column                Non-Null Count  Dtype  
---  ---  
0   year                  16 non-null    int64  
1   no_of_accounts        16 non-null    int64  
2   total_balance         16 non-null    float64  
3   average_balance       16 non-null    int64  
4   amount_withdrawn      16 non-null    int64  
dtypes: float64(1), int64(4)  
memory usage: 772.0 bytes
```

*** Column Unique Values ***

```
year values: [2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019  
2020 2021]
```

```
no_of_accounts values: [2700000 2800000 2900000 3000000 3100000 3200000 3300000 3400000 3500000  
3600000 3700000 3800000]
```

```
total_balance values: [ 36.9  39.3  42.4  45.8  50.2  54.8  60.   64.9  70.5  75.9  82.1  88.6  
96.1 102.  110.1 117.6]
```

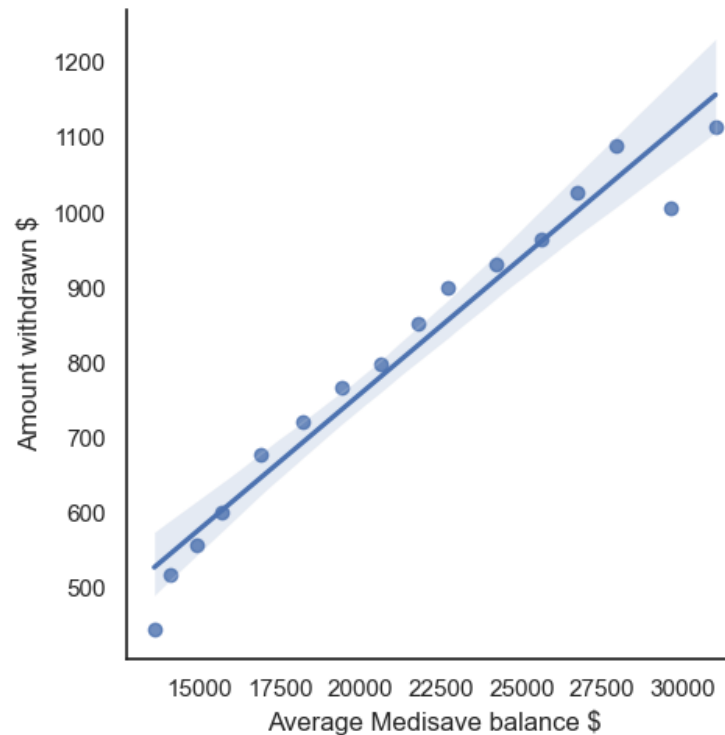
```
average_balance values: [13600 14100 14900 15700 16900 18200 19400 20600 21800 22700 24200 25600  
26700 27900 29600 31000]
```

```
amount_withdrawn values: [ 445  517  558  601  678  722  767  798  853  900  931  964 1027 1089  
1007 1115]
```

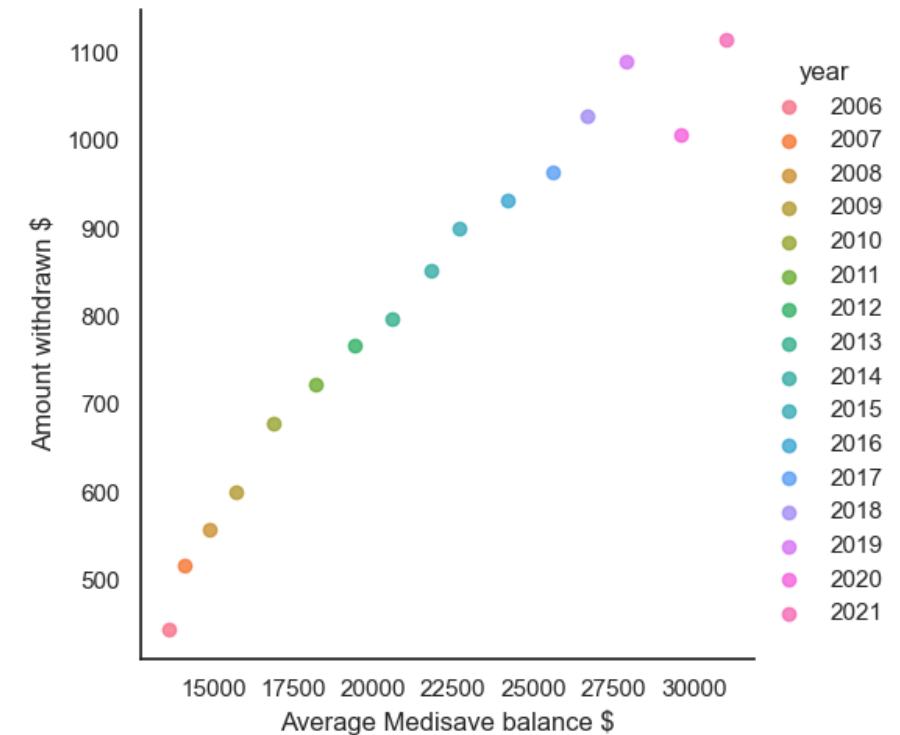
Medisave Balances

- ▶ There is a clear linear relationship from 2006 to 2021 in the average Medisave balance with amount withdrawn for healthcare spending
- ▶ Singaporeans are saving close to 30 times in terms of healthcare expenditure in their own Medisave accounts

Relationship between Medisave balance and withdrawal



Relationship between Medisave balance and withdrawal



Insurance Coverage

- ▶ 16 rows, 3 columns
- ▶ Years from 2006 to 2021
- ▶ Number of policy holders, and with private plans

*** Dataframe info ***

```
<class 'pandas.core.frame.DataFrame'>  
RangeIndex: 16 entries, 0 to 15  
Data columns (total 3 columns):  
#   Column                                Non-Null Count  Dtype  
---  ---  
0   year                                  16 non-null     int64  
1   policyholders                        16 non-null     object  
2   policyholders_with_private_plans    16 non-null     int64  
dtypes: int64(2), object(1)  
memory usage: 516.0+ bytes
```

*** Column Unique Values ***

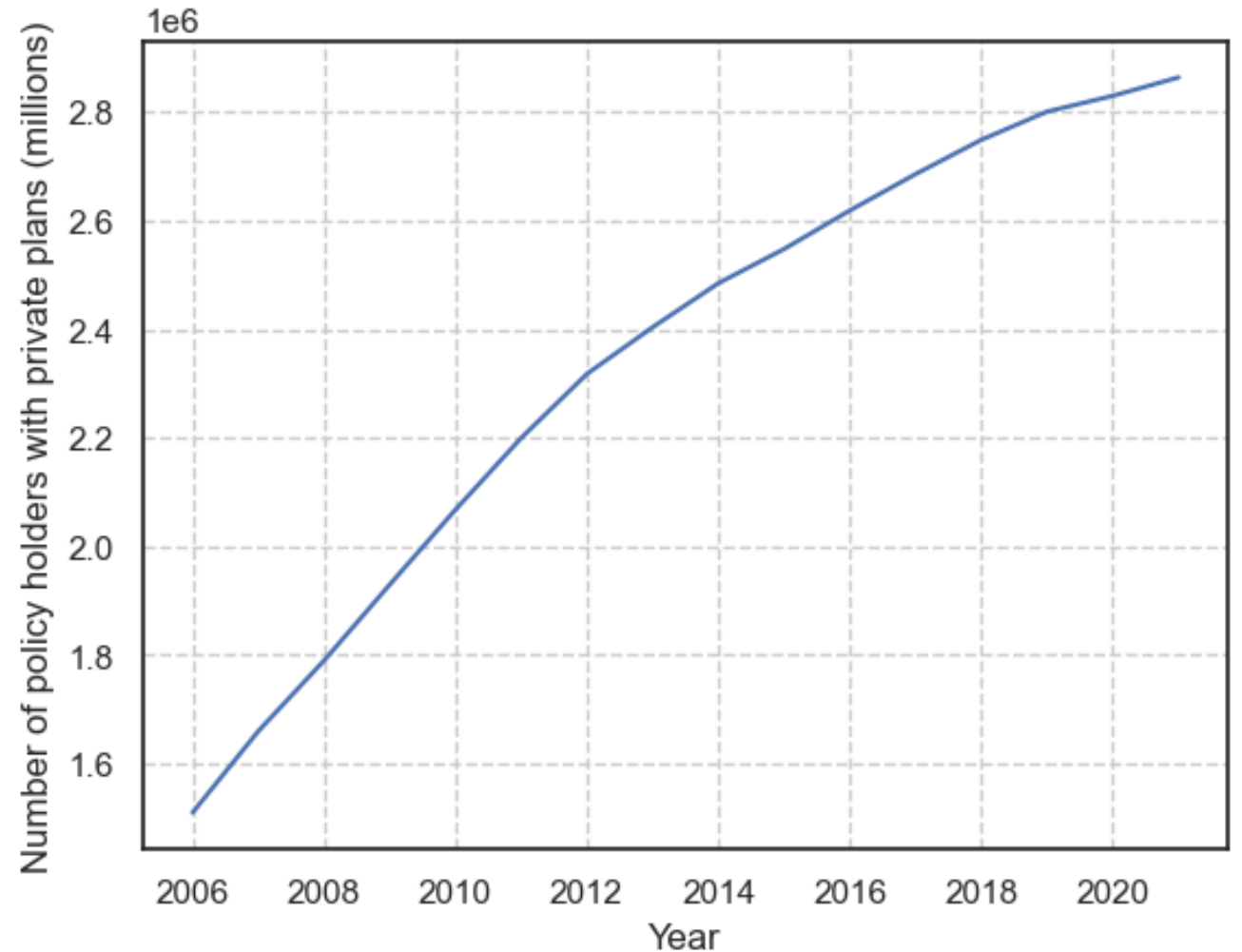
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Insurance Coverage

- ▶ There is a steady increase in number of policy holders with private plans from 2006 till 2021, breaking 2.8 million policy holders
- ▶ This is a good sign as it means that they are protected against sudden large hospital bills, and healthcare services are accessible to the general public regardless of illness



Insurance Coverage

- ▶ It is reported that the rising claims enabled by generous insurance policies lead in turn to rising premiums
- ▶ This is evidence that Singaporeans are well (overly) covered by insurance, and the huge amount of claims is increasing healthcare cost unnecessarily for the general public

Breaking health insurance vicious circle a top MOH priority, says Ong Ye Kung



About half of patients with IP and rider protection still end up using subsidised public healthcare when hospitalised or getting day surgery, said Health Minister Ong Ye Kung. PHOTO: ST FILE



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Conclusion

- ▶ Quality of healthcare services is improving over the years, extending lifespan of Singaporeans
- ▶ We need more GP clinics, polyclinics to handle long-term chronic diseases
- ▶ We need to linearly, proportionally **increase the education and training** of new healthcare professionals according to the population demand
- ▶ We need many more acute hospitals to handle the explosion of admissions, either that or to prevent non-emergency cases from visiting the acute hospitals unnecessarily
- ▶ Government's **health expenditure is not sustainable** in the long run
- ▶ Singaporeans have **enough in their Medisave accounts** to sustain a few decades, at least partially paying for their own healthcare expenditure
- ▶ Singaporeans are **generally protected against large hospital bills** due to adequate insurance coverage, assuming premiums do not increase unreasonably in the future