

# Comparison of the performance of different proxies to determine timing, intensity and severity of the South African influenza season

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# Background

South Africa like other countries with temperate climates  
 Annual influenza epidemics  
 Winter months  
 Unpredictable seasonality

## Mean onset:

Week 20( mid May)  
 Range 16(mid April) -25 (end June)

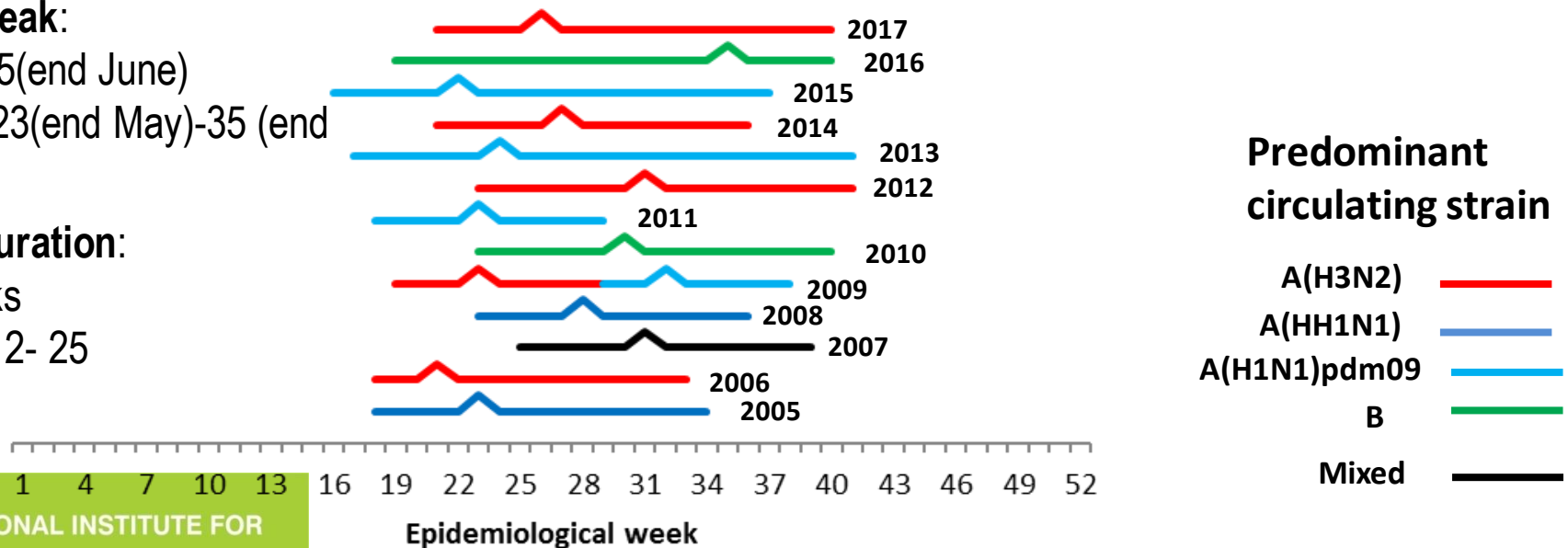
## Mean peak:

Week 25(end June)  
 Range 23(end May)-35 (end August)

## Mean duration:

19 weeks  
 Range 12- 25

**Influenza seasons Viral Watch: South Africa:2005-2017**



# Objectives

- To compare previously used Percentage detection method to the Moving Epidemic (MEM) method
- To compare the performance of different proxies using MEM
- To calculate the timing and intensity of the 2017 influenza season using MEM



# Methods

- Three influenza sentinel surveillance programmes
  - Specimens tested using rRT-PCR
- Pneumonia and influenza data from a private hospital group
- Data analysis
  - Moving Epidemic Method (MEM) a sequential analysis using R Language (<http://CRAN.R-project.org/web/package=mem>)

# Surveillance programmes used:

- **Viral Watch (VW) started in 1984**
  - An acute respiratory illness with a measured temperature ( $\geq 38^{\circ}\text{C}$ ) (or a history of fever) and cough, with onset in the last 10 days.
- **National syndromic surveillance for pneumonia (NSSP) started in 2009**
  - Any child aged 2 months to 5 years with [cough OR difficulty in breathing] AND any of the following danger signs: unable to drink or breastfeed OR vomits everything OR convulsions OR lethargy or unconsciousness OR chest in-drawing OR stridor in a calm child, within 10 days of onset.
  - Persons >5 years: Acute or chronic lower respiratory tract infection/ acute or chronic pneumonia, within 10 days of onset.
- **Influenza-like illness surveillance at public health facilities (ILI) started in 2012**
- **Respiratory consultations and hospitalisation surveillance (RCHS) data available from 2002**
  - In patients & out patients



# Proxies used to calculate thresholds

- Weekly influenza detection rates: number influenza positive/total tested
  - VW; NSSP;ILI
- Weekly proportion of patients with P&I:number of patients with ICD codes J10-J18/total number of patients
  - RCHS – In Patients; Out Patients
- Weekly proportion of patients with P&I multiplied with influenza detection rate
  - RCHS in-patients multiplied by NSSP detection rate
  - RCHS out-patients multiplied by ILI detection rate
  - RCHS out-patients multiplied by VW detection rate
- Weekly proportion of deaths in patients with P&I.

VW:Viral Watch; NSSP:National syndromic surveillance for pneumonia;  
ILI:Influenza like illness surveillance at public hospitals; RCHS : Respiratory consultations and hospitalisation surveillance

# MEM Thresholds

- Thresholds set using data from 2012-2016
- Used 40<sup>th</sup>, 90<sup>th</sup> & 97.5<sup>th</sup> percentiles
  - Below seasonal threshold
  - Low activity (>seasonal threshold, <40%)
  - Moderate activity ( $\geq 40\%$ , but <90%)
  - High activity ( $\geq 90\%$ , but <97.5%)
  - Very high activity ( $\geq 97.5\%$ )
- Transmissibility
  - Influenza detection rates for VW & ILI
- Severity
  - Weekly proportion of deaths in In-patients with P&I
- Impact
  - Influenza detection rates for NSSP & proportion hospitalised in RCHS

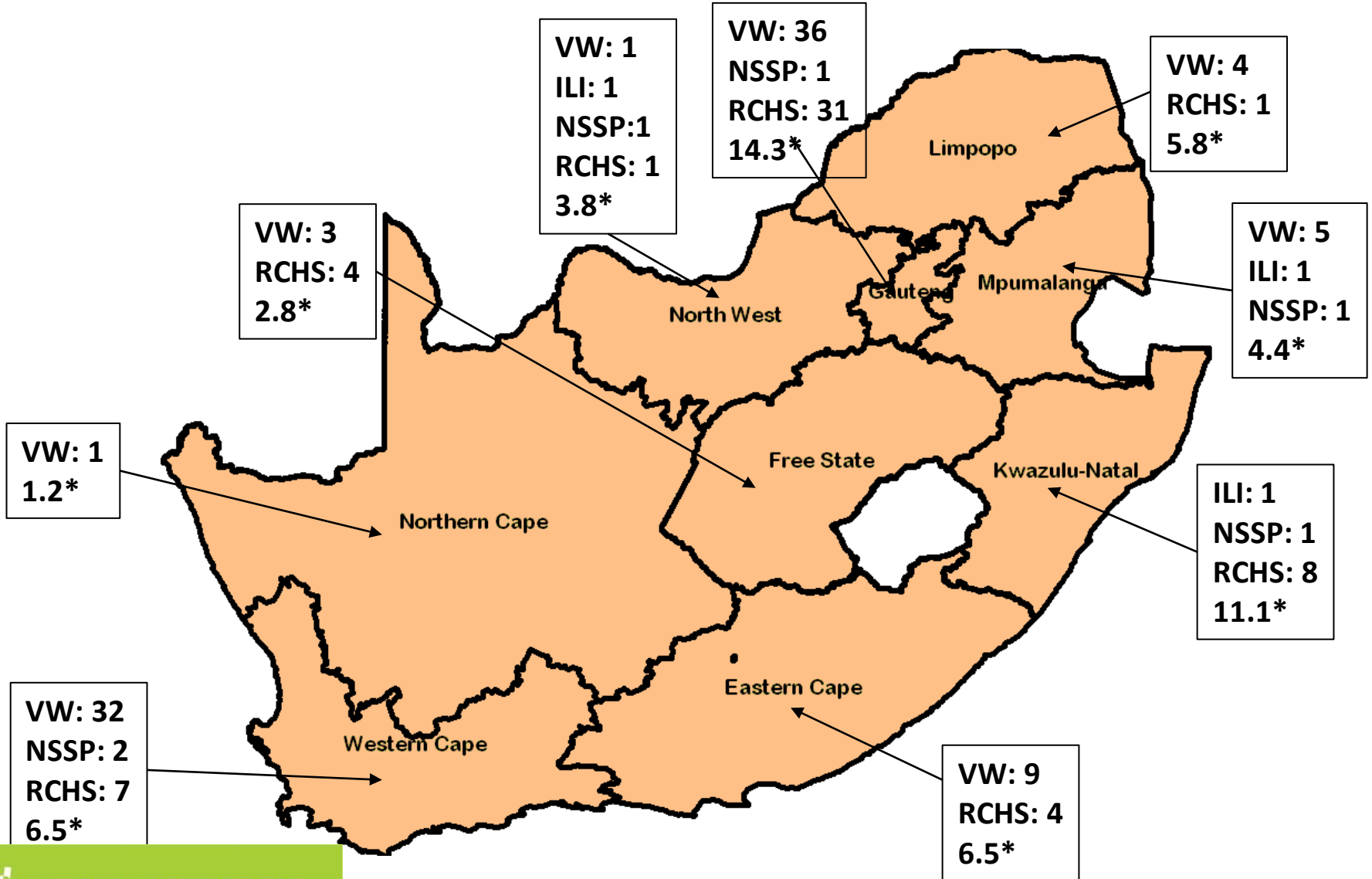
VW:Viral Watch; NSSP:National syndromic surveillance for pneumonia;  
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consultations and hospitalisation surveillance

# Characteristics of surveillance programmes: 2012-2017

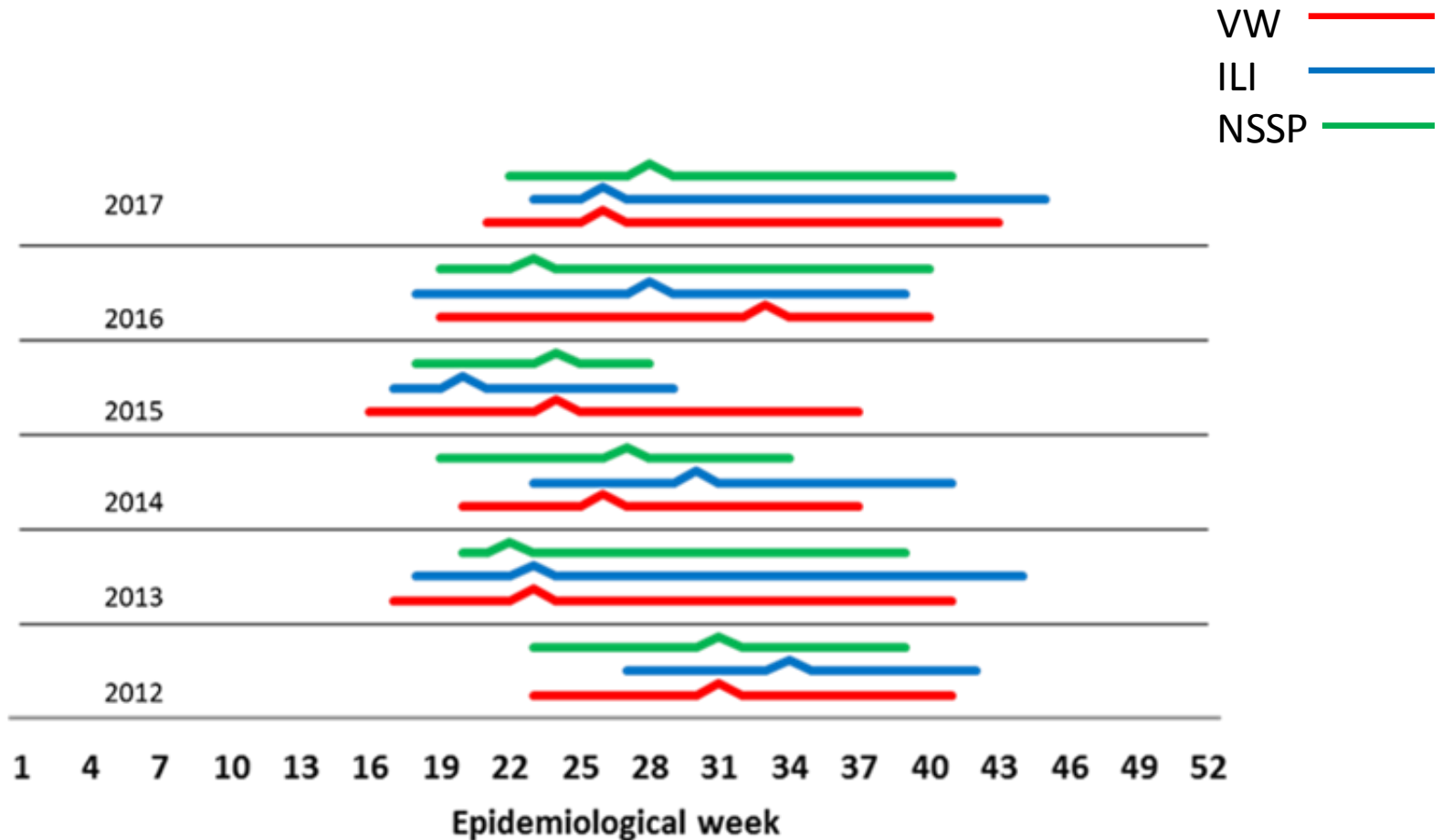
Variable	VW	ILI	NSSP	RCHS
Number of current sites	107	3	6	56
Number of provinces	8	3	5	7
Method specimen selection	Practitioners discretion	systematic	systematic	n/a
No. Patients per year				
2012	1 859	1 015	4 275	1 053 911
2013	1 820	1 973	2 724	1 202 193
2014	1 042	2 345	2 161	1 190 603
2015	1 112	1 188	3 775	1 194 360
2016	1 123	1 643	3 626	1 176 294
2017	1 318	1 980	4 706	1 151 290
Health Sector	Private	Public	Public	Private
Age range (median)	1 week – 96 years (31 years)	3weeks -88 years (4 years)	1 week – 104 years (6 months)	1 week – 106 years (37 years)



# Surveillance sites



# Influenza seasons 2012-2017 using percentage detection rate



VW:Viral Watch; NSSP:National syndromic surveillance for pneumonia;  
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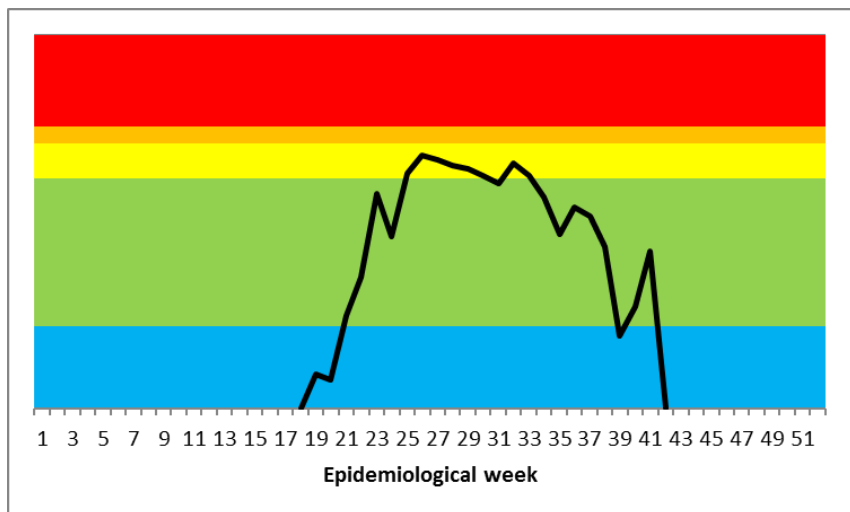
# Comparison of start & end of influenza season per surveillance programme: 2012-2017

Week of onset and end of influenza seasons: Percentage detection rate versus MEM

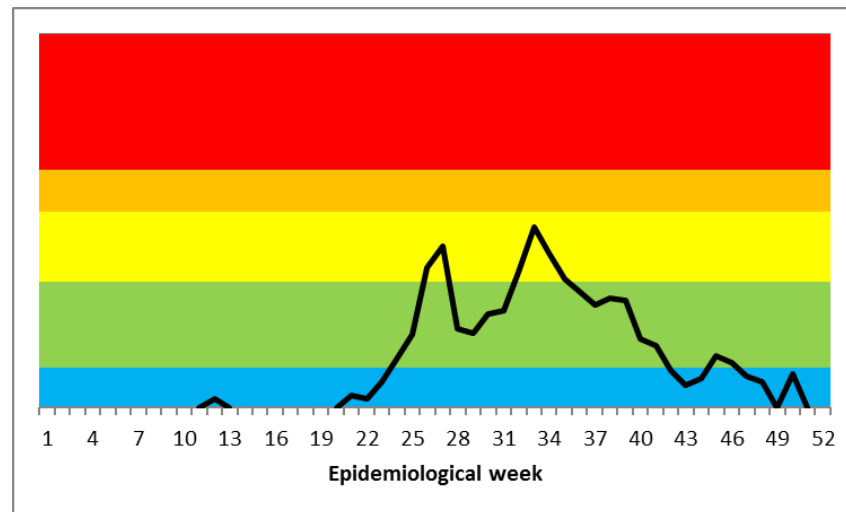
Year	VW				NSSP				ILI			
	Onset		End		Onset		End		Onset		End	
	10%	MEM	10%	MEM	5%	MEM	5%	MEM	5%	MEM	5%	MEM
2012	23	23	41	38	23	23	39	39	27	29	42	42
2013	17	18	41	43	20	19	39	39	18	19	45	45
2014	20	20	37	41	19	19	34	34	23	25	41	35
2015	16	15	37	38	18	18	28	28	17	17	29	29
2016	19	18	40	40	19	19	40	40	18	19	39	36
2017	21	21	43	43	22	22	41	41	23	24	45	41

# 2017 Season: Thresholds based on 2012-2016 data: Transmissibility

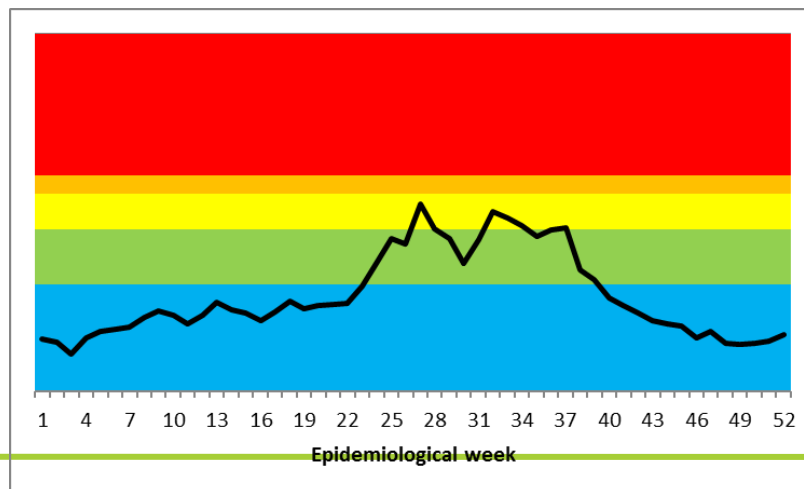
## Viral Watch



## ILI



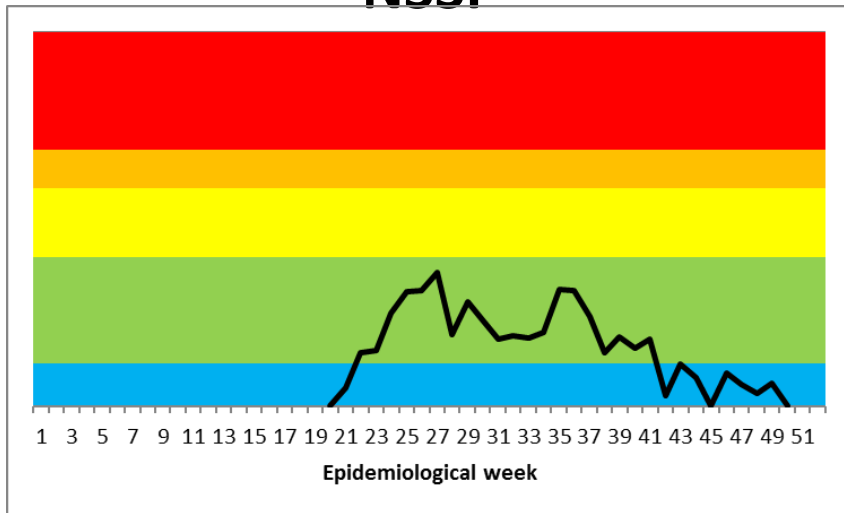
## RCHS: Out Patients



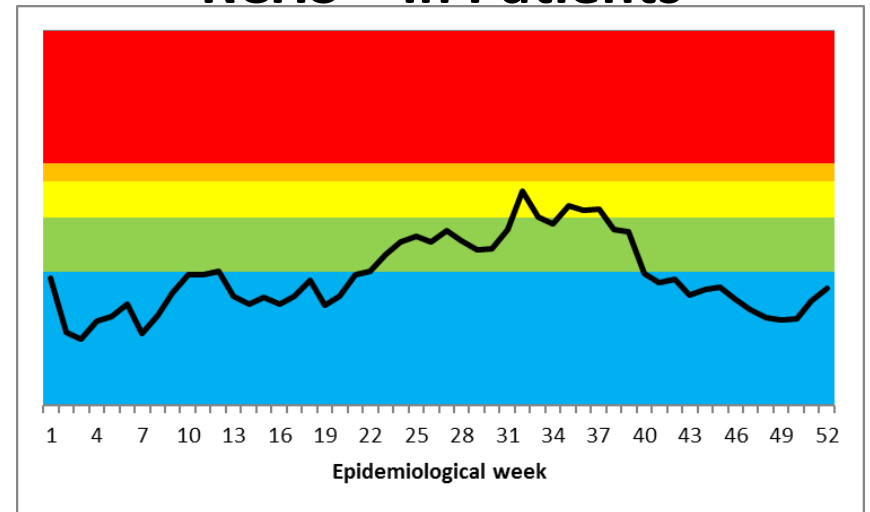
	Very High
	High
	Moderate
	Low
	Below Threshold

# 2017 Season: Thresholds based on 2012-2016 data: Impact/Severity of disease

NSSP

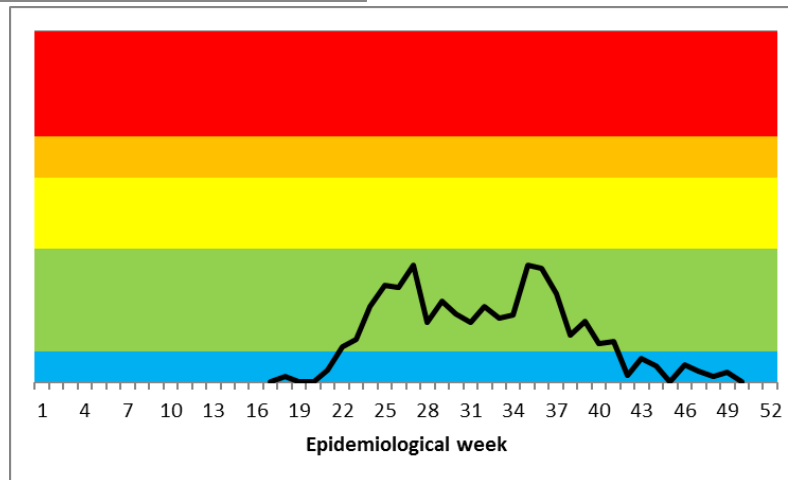


RCHS – In Patients



Epidemiological week

Epidemiological week



Epidemiological week

	Very High
	High
	Moderate
	Low
	Below Threshold

NSSP X RCHS-In Patients

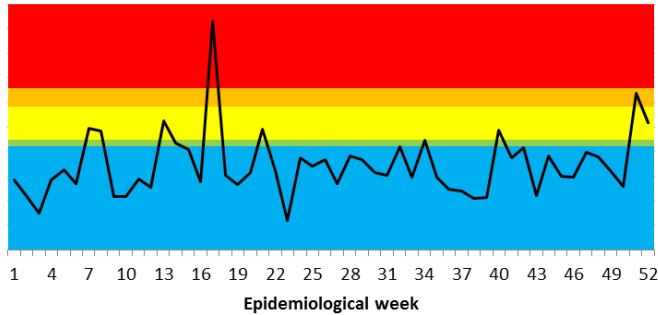


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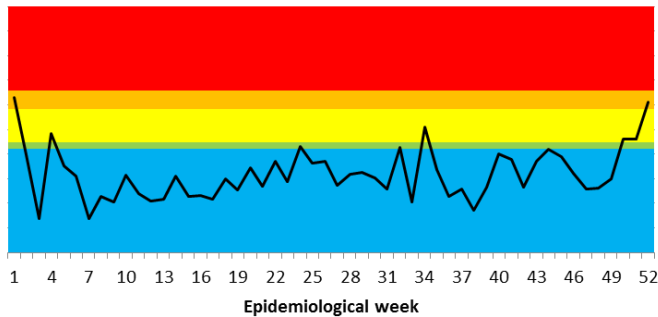
Division of the National Health Laboratory Service

# RCHS In-Patient Deaths

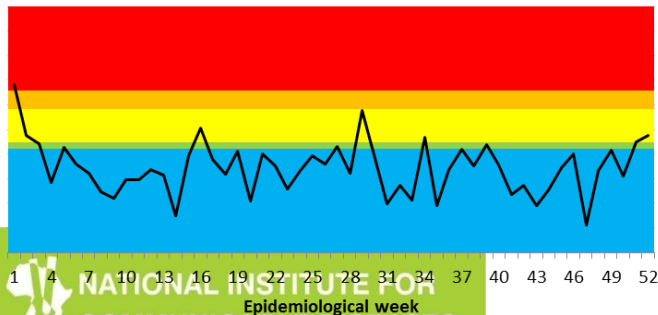
2012



2013



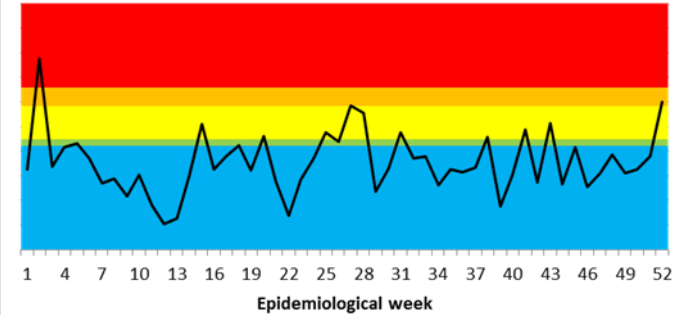
2014



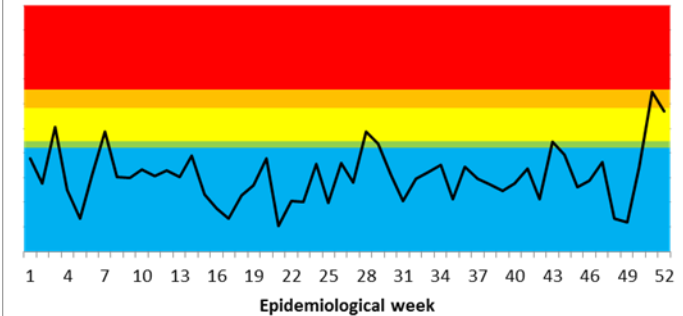
20 000 to 22 000  
In patients with  
P&I per year  
600 -700 deaths

	Very High
	High
	Moderate
	Low
	Below Threshold

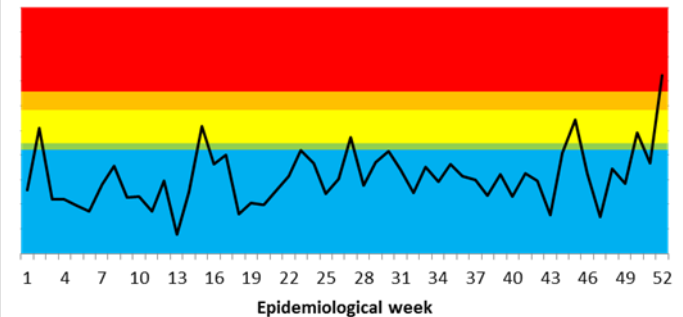
2015



2016



2017



# Defining the level of the influenza season using MEM : 2012 -2017

	Season level per programme					
	2012	2013	2014	2015	2016	2017
VW	Moderate	Moderate	Very High	Moderate	Moderate	Moderate
ILI	High	Moderate	Moderate	Moderate	Low	Moderate
RCHS Out Patients	Moderate	High	Moderate	High	Moderate	Moderate
OutPtsxILI	Moderate	Moderate	Moderate	High	Low	High
OutPtsxVW	Moderate	Moderate	Very High	High	High	Moderate
NSSP	High	Moderate	Moderate	Moderate	Moderate	Low
RCHS In Patients	Moderate	Moderate	Low	Moderate	Moderate	Moderate
InPtsxNSSP	High	Moderate	Moderate	High	Moderate	Low

VW:Viral Watch; NSSP:National syndromic surveillance for pneumonia;  
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# Conclusions

- **Comparison of previously used methods to the MEM method**
  - Onset of season similar
    - NSSP best correlation, ILI worst
- **Comparison of the performance of different proxies using MEM**
  - VW most useful for onset of season & good proxy for transmissibility
  - ILI start of season up to 5 weeks delayed
  - RCHS OPD >2weeksVW<1week ILI
  - Product of OPD & VW/ILI similar
  - NSSP & RCHS In Patients of looks to be useful for impact/severity?

VW:Viral Watch; NSSP:National syndromic surveillance for pneumonia;  
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# Conclusions (2)

- **Calculate the timing and intensity of the 2017 influenza season using MEM**
  - Calculate thresholds once
  - Automated
  - A moderate season for transmissibility
  - A low season for impact/severity
  - Other proxies

# Acknowledgements

- CRDM staff
- Viral Watch Practitioners
- Pneumonia surveillance & ILI surveillance programme members
- Netcare Ltd

