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Historical Perspectives in Epidemiology: Panum's 1846 Measles study and its impact on Modern Epidemiology - Part II

This is the second article of two in a series on "Historical Perspectives in Epidemiology: Panum's 1846 Measles study and its impact on Modern Epidemiology"

During his investigations, Dr Panum was able to identify new facts about the spread of measles. These have been listed below with how the findings contributed to modern epidemiology.

Concepts	Panum's findings	Modern Epidemiology
High attack rate	The outbreak exhibited a high attack rate with the disease spreading rapidly throughout the population.	This epidemic illustrated the concept of a '**susceptible population**' which is a fundamental aspect in epidemiology as the **attack rate** (or the proportion of susceptible individuals who become infected) helps to assess the potential impact of an outbreak and the effectiveness of interventions such as vaccination.
Susceptibility	All age groups in these virgin populations could be affected, with mortality being common. Virgin populations referred to those that had not had an outbreak in decades. In such type of virgin populations, nearly all will be infected.	
Modes of transmission	Panum observed that measles was primarily spread through respiratory droplets when infected individuals coughed or sneezed. This emphasized the importance of respiratory hygiene and relevant measures in controlling the spread of the disease. Additionally, when infected individuals were isolated, further transmission of the disease was prevented within those communities.	To halt transmission of a disease, understanding how it is passed from one individual to another is important. Today, more advanced techniques such as contact tracing and molecular epidemiology where sequencing of viral genomes is done, are conducted to understand pathways of transmission.
Immunity	Contracting natural infection conferred lifelong immunity as was the case among the elderly population among the Faroese who had contracted measles during the outbreak in 1781.	Understanding natural immunity is important for modelling disease spread and evaluating the potential for herd immunity. This is also critical for developing vaccination strategies as it assists us towards determining the level of immunity required to prevent outbreaks.
Incubation period & infectiousness	An incubation period of about 14 days was noted from infection to the onset of disease symptoms. He also noted that individuals were contagious before the display of symptoms.	This concept is important in today's context by helping us to predict the spread of the disease, when to implement quarantine measures and to advise on the duration of isolation.
Epidemic Curve	Panum described the progression of the measles epidemic over time, noting the dramatic rise and subsequent fall in case numbers.	Plotting epidemic curves or epi curves is a standard practice to visualize the course of an outbreak. This helps epidemiologists understand the dynamics of transmission, and the impact of interventions and predict future trends.
Role of Isolation & Quarantine	The importance of isolating infected individuals to prevent the spread of disease was crucial in controlling the epidemic at the time.	Key strategies to control infectious diseases include isolation and quarantine as was seen in the COVID-19 pandemic.
Field Epidemiology	The systematic collection and analysis of data from the field during this epidemic laid the groundwork for field epidemiology.	To this day, this tradition is continued by field epidemiologists by investigating outbreaks at the ground level, collecting data and implementing control measures. The Epidemic Intelligence Service (EIS) by the CDC & Epidemic Intelligence from Open Sources (EIOS) initiative by WHO are descendants of this approach.

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Panum's medical ethnography of the Faroe Islands accompanied by his clinical insights was considered as the 'geography of the disease' or 'geographic pathology' (early names for 'epidemiology'). Nowadays, we consider it as population research based on the 'web of causation' which is usually multivariate (consisting of social, behavioural and biological variables).

Measles being a respiratory disease was one of the diseases most easily explained by the miasmatic (bad air) interpretation. However, the defined incubation period was a powerful factor to indicate that measles could not be miasmatic but must be purely contagious in nature. The contagious nature of the disease in Faroe Islands was verified by Panum who identified the first case as a cabinetmaker from Copenhagen, from whom the disease had spread to others in the Islands. Thus, the disease had to be caused by something beyond our perception of the five senses. This finding paved the way for the work of eminent scientists such as Louis Pasteur and Joseph Lister who introduced the modern germ theory in the late 1800s.

Dr Panum's work also emphasized the importance of paying attention to detail, carrying out proper data analysis and explanation of the results, and the use of interdisciplinary thinking. His theory of contagion was confirmed by the work of the English physician John Snow as evidenced during the cholera outbreak in London in 1854. Similar to the methodology used by Panum in the measles epidemic; through careful mapping of the cholera outbreak, John Snow was able to elicit a single connection in common to the affected patients: they had all retrieved water from a specific local street pump. His theory was proved by removing the pump handle, effectively stopping the outbreak.

The observations made during the measles epidemic on the Faroe Islands have been instrumental in advancing our understanding of the epidemiology of infectious diseases. These findings laid the foundation for modern public health measures such as surveillance, quarantine, and vaccination in controlling and preventing the spread of infectious diseases thus leading the way towards modern epidemiology.
Modern epidemiology has evolved to include sophisticated statistical models, global surveillance systems, genetic sequencing methods and advanced public health interventions. However, the core concepts observed by Dr Panum remain central to the discipline of modern epidemiology, illustrating the timeless nature of his contributions.

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References:

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2. Melgaard, Craig A. and Golbeck, Amanda L. (2014) "Peter Ludwig Panum and the Danish School of Epidemiology," *The Bridge:* Vol. 37: No. 2, Article 7. https://scholarsarchive.byu.edu/thebridge/vol37/iss2/7

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Table 1 : Water Quality Surveillance
Number of microbiological water samples April 2024

District	MOH areas	No: Expected *	No: Received
Colombo	18	108	**4**
Gampaha	15	90	**NR**
Kalutara	13	78	**88**
Kalutara NIHS	2	12	**12**
Kandy	23	138	**14**
Matale	13	78	**10**
Nuwara Eliya	13	78	**30**
Galle	20	120	**109**
Matara	17	102	**27**
Hambantota	12	72	**26**
Jaffna	14	84	**149**
Kilinochchi	4	24	**NR**
Mannar	5	30	**1**
Vavuniya	4	24	**54**
Mullatvu	6	36	**17**
Batticaloa	14	84	**0**
Ampara	7	42	**8**
Trincomalee	12	72	**0**
Kurunegala	29	174	**NR**
Puttalam	13	78	**NR**
Anuradhapura	23	138	**0**
Polonnaruwa	9	54	**0**
Badulla	16	96	**2**
Moneragala	11	66	**1**
Rathnapura	20	120	**NR**
Kegalle	11	66	**0**
Kalmunai	13	78	**0**

* No of samples expected (6 / MOH area / Month)
NR = Return not received

To be continued...

Table 1: Selected notifiable diseases reported by Medical Officers of Health 04th – 10th May 2024 (19th Week)

RDHS	Dengue Fever		Dysentery		Encephalitis		En. Fever		F. Poisoning		Leptospirosis		Typhus F.		Viral Hep.		H. Rabiies		Chickenpox		Meningitis		Leishmania-		Tuberculosis		WRCD	
	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	A	B	T*	C**
Colombo	75	4626	1	9	0	4	3	31	0	5	11	175	0	8	0	5	0	0	13	198	1	13	0	0	37	785	**95**	**100**
Gampaha	55	2026	2	12	0	6	0	5	2	4	11	256	0	3	0	1	0	0	17	135	3	46	1	9	31	458	**86**	**99**
Kalutara	31	1341	0	15	0	1	1	23	1	13	16	283	0	5	0	6	0	0	13	281	1	27	0	0	0	215	**80**	**100**
Kandy	71	1882	6	14	0	0	0	6	10	19	6	106	1	12	0	4	0	0	8	226	2	11	1	19	1	232	**100**	**100**
Matale	13	355	0	2	0	0	0	2	0	17	3	46	0	1	0	4	0	0	5	55	0	6	1	104	6	54	**100**	**100**
Nuwara Eliya	4	190	4	40	0	4	0	4	6	143	2	86	1	25	0	3	0	0	12	103	1	4	0	0	8	117	**100**	**100**
Galle	21	1098	1	20	0	9	2	7	4	33	18	312	2	49	1	6	0	1	21	281	2	34	0	3	10	167	**95**	**100**
Hambantota	18	505	2	18	0	1	0	3	0	33	7	265	0	18	1	3	0	0	6	132	0	14	20	206	6	44	**100**	**100**
Matara	16	414	0	4	0	3	0	2	0	4	7	144	0	9	0	2	0	0	17	160	3	41	0	38	4	49	**100**	**100**
Jaffna	19	4968	4	33	1	2	0	4	0	22	0	12	0	357	0	3	0	1	10	126	0	7	0	0	16	119	**86**	**93**
Kilinochchi	0	268	0	5	0	0	0	2	0	2	0	15	0	7	0	0	0	0	0	5	0	4	0	0	1	9	**100**	**100**
Mannar	1	184	1	1	0	0	0	1	0	0	0	16	0	6	0	1	0	0	0	4	0	3	0	1	3	26	**100**	**100**
Vavuniya	4	129	0	0	0	0	0	1	0	7	0	56	0	2	0	4	0	0	2	17	0	7	0	6	0	11	**75**	**100**
Mullaitivu	2	181	0	4	0	0	0	0	0	2	0	53	0	10	0	0	0	0	0	2	0	0	0	5	0	13	**100**	**100**
Batticaloa	19	1075	8	66	1	7	0	4	0	16	1	33	0	1	0	8	0	0	3	52	1	23	0	1	1	54	**100**	**100**
Ampara	0	147	0	14	0	2	0	0	0	12	4	127	0	1	0	4	0	0	1	56	1	22	0	6	2	73	**100**	**100**
Trincomalee	18	468	0	10	0	0	0	2	1	2	3	107	0	10	0	0	0	0	1	28	0	7	0	8	5	35	**100**	**100**
Kurunegala	34	1296	1	16	2	17	0	1	1	342	7	286	0	16	0	2	0	2	9	205	9	124	23	238	0	192	**86**	**100**
Puttalam	7	641	0	1	0	1	0	3	0	0	2	130	0	5	0	1	0	0	8	67	1	28	2	13	0	72	**69**	**100**
Anuradhapura	5	486	1	5	0	2	1	1	5	9	5	220	0	24	1	7	0	0	6	99	1	21	33	356	4	100	**91**	**100**
Polonnaruwa	6	203	1	13	0	0	0	1	0	2	2	135	0	1	0	2	0	0	2	72	2	17	5	192	4	43	**89**	**100**
Badulla	7	512	0	11	0	4	0	0	1	21	10	242	0	13	0	10	0	0	6	138	0	13	0	12	6	84	**69**	**100**
Monaragala	12	406	0	5	0	2	0	1	0	68	16	455	0	17	1	13	0	0	2	53	0	49	6	98	0	31	**100**	**100**
Ratnapura	88	1169	3	47	0	3	0	3	1	8	31	712	1	12	1	13	0	2	5	136	5	58	0	75	4	126	**95**	**100**
Kegalle	56	1090	2	7	0	4	0	5	0	4	12	260	0	9	0	5	0	1	28	351	4	30	1	15	8	130	**100**	**100**
Kalmunai	7	528	1	11	0	0	0	0	0	5	2	42	0	1	0	1	0	0	15	102	1	8	0	0	4	54	**100**	**100**
SRILANKA	**589**	**26188**	**38**	**383**	**4**	**72**	**7**	**112**	**32**	**793**	**176**	**4574**	**5**	**622**	**5**	**108**	**0**	**7**	**210**	**3084**	**38**	**617**	**93**	**1405**	**161**	**3293**	**93**	**99**

Source: Weekly Returns of Communicable Diseases (esurvillance.epid.gov.lk). T=Timeliness refers to returns received on or before 10th May, 2024 Total number of reporting units 358 Number of reporting units data provided for the current week: 357 **C****-Completeness

A = Cases reported during the current week. B = Cumulative cases for the year.

Table 2: Vaccine-Preventable Diseases & AFP

04th – 10th May 2024 (19th Week)

Disease	No. of Cases by Province									Number of cases during current week in 2024	Number of cases during same week in 2023	Total number of cases to date in 2024	Total number of cases to date in 2023	Difference between the number of cases to date in 2024 & 2023
	W	C	S	N	E	NW	NC	U	Sab					
AFP*	00	00	00	00	00	00	00	00	00	00	00	31	29	6.9 %
Diphtheria	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Mumps	01	01	01	00	01	00	01	00	03	08	04	110	83	32.5 %
Measles	00	00	01	01	01	00	00	00	00	03	00	205	00	0 %
Rubella	00	00	00	00	01	00	00	00	00	01	00	02	01	100 %
CRS**	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Tetanus	00	00	00	00	00	00	00	00	00	00	00	02	01	100 %
Neonatal Tetanus	00	00	00	00	00	00	00	00	00	00	00	00	00	0 %
Japanese Enceph-alitis	00	00	00	00	00	00	00	00	00	00	00	01	02	-50 %
Whooping Cough	00	00	00	00	00	00	00	00	00	00	00	06	03	100 %

Key to Table 1 & 2

Provinces: **W**: Western, **C**: Central, **S**: Southern, **N**: North, **E**: East, **NC**: North Central, **NW**: North Western, **U**: Uva, **Sab**: Sabaragamuwa.

RDHS Divisions: **CB**: Colombo, **GM**: Gampaha, **KL**: Kalutara, **KD**: Kandy, **ML**: Matale, **NE**: Nuwara Eliya, **GL**: Galle, **HB**: Hambantota, **MT**: Matara, **JF**: Jaffna, **KN**: Killinochchi, **MN**: Mannar, **VA**: Vavuniya, **MU**: Mullaitivu, **BT**: Batticaloa, **AM**: Ampara, **TR**: Trincomalee, **KM**: Kalmunai, **KR**: Kurunegala, **PU**: Puttalam, **AP**: Anuradhapura, **PO**: Polonnaruwa, **BD**: Badulla, **MO**: Moneragala, **RP**: Ratnapura, **KG**: Kegalle.

Data Sources:

Weekly Return of Communicable Diseases: Diphtheria, Measles, Tetanus, Neonatal Tetanus, Whooping Cough, Chickenpox, Meningitis, Mumps., Rubella, CRS,

Special Surveillance: AFP* (Acute Flaccid Paralysis), Japanese Encephalitis

CRS =**Congenital Rubella Syndrome

NA = Not Available

Take prophylaxis medications for leptospirosis during the paddy cultivation and harvesting seasons.

It is provided free by the MOH office / Public Health Inspectors.

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ON STATE SERVICE

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