MEASUREMENT OF MORBIDITY AND SOME HOSPITAL INDICATORS

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RATES RATIOS & PROPORTIONS

VITAL EVENTS:

Types of Measures

- Static
- Dynamic

Static: Description of static state of community at a point/short period of time.

Dynamic: To Describe the rapidity of change over time.

Ratio: Relation in size of two random quantities at a particular time. X : Y

Ex: Sex-ratio, Doctor - Population Ratio, Child Women Ratio…….

$$\text{Ratio} = \frac{a}{b}$$

RATES RATIOS & PROPORTIONS

$$\text{Ratio} = \frac{a}{b}$$

$$\text{Prop.} = \frac{a}{a + b}$$

$$\text{Percentage} = \frac{a}{(a + b)} \times 100\%$$

eg.

$$\text{Ratio} = \frac{M}{F}$$

$$\text{Prop} = \frac{M}{M + F} = (p_1, \text{ say})$$

$$\text{Prop} = \frac{F}{M + F} = (p_2, \text{ say})$$

$$p1 + p2 = \frac{M + F}{M + F} = 1$$

RATES RATIOS & PROPORTIONS

- Prop. may be called ‘relative frequency’ if Nr & Dr are integars.
- Prop. is called fraction if a & b are not necessarily integars.
- Percentage = 100 p.

Foetal Death Ratio:

$$= \frac{\text{No. of foetal Deaths}}{\text{No. of live Births}}$$

DIFFERENCE BETWEEN RATIO & INDEX

Index: Summary Measure to reflect relationship among variables.

$$\text{e.g. BMI} = \frac{\text{Wt (in kg)}}{\text{Ht}^2 \text{ (in meter)}}$$

$$\text{Wt / Ht Index} \equiv \frac{W}{H}$$

Waist / Hip Ratio …

Proportion: A ratio indicating relation in magnitude of a part to the whole (Dr is include in Nr)

e.g Proportion of under 5 children

Proportion of malnourished children

DIFFERENCE BETWEEN RATIO & INDEX

Rate: Proportion per unit time.

$$\frac{a}{a+b} \quad \text{per unit time}$$

Note : Nr should arisen from Dr (a part of Dr)

: Each included in Dr should contribute Nr

But exceptions …….

e.g. IMR

MMR

NMR

PNMR

Crude rate & specific rates……

Specific rates are referred to one special segment of population


MEASURES OF MORBIDITY
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MEASURES OF MORBIDITY

- **Meaning**

How to measure

- Persons
- Illness (spells on episodes)
- Duration

Morbidity Indicators

(frequency, duration & severity)

Measures of Disease Frequency → **IR**

Measures of Disease Frequency → **PR**

Uses

- Extent and Nature of Disease
- Disease Prevention
- Monitoring and Evaluation

MEASURES OF MORBIDITY

Drawback

Exclusion of sub-clinical cases

Incidence ⇒ Rapidity

Prevalence ⇒ Extent / Status of Disease

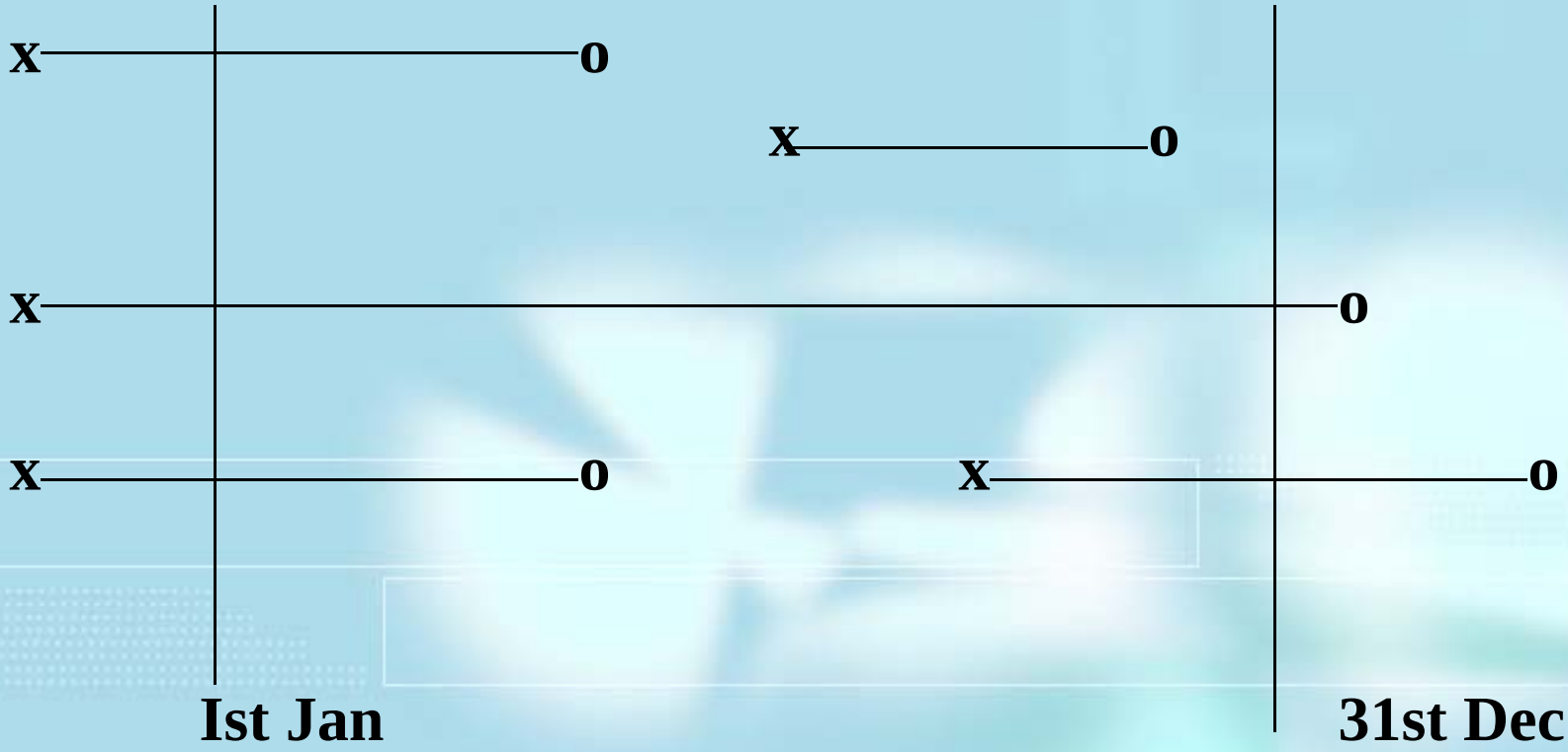
Prevalence Rate

- **Point**
- **Period**

Incidence Rate

- **Persons**
- **Spells.**

MEASURES OF MORBIDITY



Relationship : **P = I x D**

MEASURES OF MORBIDITY

High Prevalence ⇒ Chronic Condition

Uses:

To predict public health needs (facilities / manpower Material)

High Incidence ⇒ High Risk

Uses:

Effectiveness of diseases prevention or control programme

MEASURES OF MORBIDITY

- **Cumulative Incidence (CI)**

&

- **Incidence Density (ID)**

CI = No. of new cases (in fixed cohort) during specified time

Total no. of people at risk

= Sum of age - specific incidence rates.

CI = No. of new cases during specified period

Person - time at risk for disease

Person - Time ≡ Person - Years

Person - Days

Person - Weeks

MEASURES OF MORBIDITY

= No. of disease - free years contributed by each individual in study population

N

= Σ tj = total person - year exposed to risk.

j=1

tj = Length of period during which jth individual was under observation

Morbidity Indices:

Index	**Nr**	**Dr**
Ratio	D^+	D^-
Proportion	D^+	D^+ & D^- (combined)
Rate	D^+ incidence	Population at risk D^+ & D^-

INDICES FROM HOSPITAL RECORDS

HF includes:

- Outpatient (OPD)
- Inpatient (IPD)
- Medical Records (MRD)


Quality Care Indicators
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Quality Care Indicators

Quality Care Indicators includes:

Gross Death Rate:

$$= \frac{\text{Total No of HF Deaths x100}}{\text{Total No of Separations}}$$

Net Death Rate:

$$= \frac{\text{Total No of HF Deaths after 48 hrs of admn x100}}{\text{Total No of Separations excluding deaths within 48 hrs after lodging}}$$

Anaesthesia Death Rate:

$$\frac{\text{Total No of HF Deaths due to anaesthetic agents}}{\text{Total No of anaesthesia administered}} \times 100$$

It includes deaths on OT caused by anaesthetic agents not due to surgical complications.

Post Operative Death Rate:

$$\frac{\text{Total No of HF Deaths within 10 days}}{\text{Total No of surgeries performed}} \times 100$$

Maternity Unit Death Rate:

$$\frac{\text{Total No of HF Maternal Deaths x100}}{\text{Total No of obstetric patients separated}}$$

Infant Death Rate:

$$\frac{\text{Total No of Infant Deaths born in the HF x1000}}{\text{Total No of Infants separated}}$$

Foetal Death Rate

$$\frac{\text{Total No of Foetal Deaths in the HF after 20 weeks of gestation x1000}}{\text{Total No of births in the HF}}$$

INDICES OF UTILIZATION OF HF

- **Average Duration of Stay in the HF:**

$$= \frac{\text{Total no of inpatient days}}{\text{Total No of separations}}$$

Note:

1. Day of admn is to be counted but not the day of discharge ias stay in the HF
2. In case admn and discharge on the same day, count at least one day of stay

Bed Occupancy Ratio (BOR):

$$= \frac{\text{Actual No of occupied bed –days x100}}{\text{Available bed-days}}$$

Ex:

If there are 35 beds in a ward and 570 beds were occupied during the month of Dec 08

$$\text{BOR} = \frac{570 \times 100}{35 \times 31} \%$$

Turnover Interval:

$$= \frac{\text{No of vacant bed days x100}}{\text{Total No of separations}}$$

This is a measure of demand/pressure on beds.

MEASURES OF MORTALITY

(1) CDR:

Deaths from all causes per 1000

$$\textbf{CDR} = \frac{D}{P} \times 1000$$

(2) Age-specific death rate (ASDR)

$$= \frac{\text{No. of deaths in specified age group in a given period}}{\text{Total Population}}$$

$$= \frac{D_s}{P} \times 1000$$

(3) Stillbirth rate / Late fetal death rate

$$= \frac{\text{Total no. of still births}}{\text{Total no. of births}}$$

MEASURES OF MORTALITY

(4) Perinatal mortality rate:

$$= \frac{\text{No. of perinatal deaths*}}{\text{Total no. of births}}$$

* ≡ Late fetal deaths and deaths during one week after births

(5) Neonatal mortality rate (NMR)

$$= \frac{\text{Total no. of neonatal deaths}}{\text{Total no. of live births}}$$

(6) Post-neonatal mortality rate (PNMR)

$$= \frac{\text{No. of deaths of infants after 28 days}}{\text{Total no. of live births}}$$

MEASURES OF MOTALITY

(7) Infant Mortality Rate (IMR): (Risk of dying during infancy)

$$\text{IMR} = \frac{\text{No. of Infant deaths}}{\text{Total no. of live births}}$$

(8) Maternal Mortality Rate (MMR):

$$\text{MMR} = \frac{\text{Total no. of maternal deaths*}}{\text{Total no. of live births}}$$

* ≡ Female deaths due to complications of pregnancy, child birth and the puerperium.

Why live births only in denominator?

It should be no. of pregnant women.

There may be still births / twins / abortions etc.

Net count ≈ no. of live births.

Ideally it should include all deliveries and abortions.

MEASURES OF MOTALITY

(9) Disease (Cause) - specific death rate:

(To measure the risk of death from the disease)

$$= \frac{\text{Total no. of deaths due to a specified disease condition (cause)}}{\text{Estimated Total Population}}$$

(10) Case-fatality rate (CFR)

(To measure how fatal a disease is

$$= \frac{\text{Total no. of deaths due to a given disease / condition}}{\text{Total no. of persons who suffered from the same disease condition during the same period}}$$

MEASURES OF PREGNANCY WASTAGE:

- Fetal Death Ratio
- Fetal Death Rate
- Perinatal Mortality Rate
- Maternal Mortality Rate

STANDARDIZED / ADJUSTED DEATH RATES

Why? Required:

Summary index of total mortality used to compare mortality rates of different populations and is unaffected by differences in age and sex differences.

Direct Method of Standardization

$$\textbf{SDR} = \frac{\Sigma m_x \, p_x^*}{\Sigma \, p_x^*} \times 1000$$

m_x = age-specific death rate of study population for age group x.

p_x*= No of persons in age group x.

STEPS

1. Calculate ASDR for each age group for study population (m_x)

2. Multiply m_x by no. of persons in standard population p_x^* i.e obtain $m_x\ p_x^*$ for corresponding age groups and write this in next column

3. Obtain sum / total of all $m_x\ p_x^*$ is $\Sigma m_x\ p_x^*$

STANDARDIZED / ADJUSTED DEATH RATES

This gives us total expected no of deaths in the standard population assuming special death rates of study population.

4. Find total no. of persons in the standard population Σp_x^*

5. Find SDR $= \dfrac{\Sigma m_x p_x^*}{\Sigma p_x^*}$

Total no. of exp. Deaths in standard population assuming age specific death rates of study population

$= \dfrac{}{\text{Total standard population}}$

CHOICE OF STANDARD POPULATION

Hence Directly Standardized Death Rate (DSDR) is CDR (Crude Death Rate) of standard population assuming ASDR of study population to be applied in the standard population.

Indirect Method of Standardization

Used when reliable age - sp. DR (ASDR) for study population are not available only CDR and age structure of study population is available.

Then

SDR = CDRXC

CHOICE OF STANDARD POPULATION

Where

C = Adjustment Factor given only

(CDR) standard

C =

Index Death Rate

Index Death Rate (IDR)

= Total exp. Deaths in study population assuming ASDR of st. population

Total study population

Choice of standard population?

We also calculate

Standardized Mortality Ratio (SMR) in this case

$$\textbf{SMR} = \frac{\text{Observed deaths in study population}}{\text{Expected deaths in study population assuming ASDR of standard population}}$$

$$= \frac{\Sigma m_x p_x}{\Sigma m_x^* p_x}$$

STANDARDIZED DR (STDR)

Age in years	ASDR per 1000	Standard Popun $m_x p_x^*$	Expected Deaths $m_x p_x^*$
0 – 1	15	2400	36
1 – 4	4.4	9600	42.24
5 – 14	3.0	19000	57
15 – 19	3.0	9000	27
20 – 24	4.0	8000	32
25 – 34	3.1	14000	43.4
35 – 44	5.3	12000	63.6
45 – 54	12.5	11000	134.5
55 – 64	21.4	8000	171.2
Total		**93,000**	**609.94**

$$\text{STDR} = \frac{\text{Exp. Deaths}}{\text{Total St. Popn.}} \times 1000$$

$$= \frac{\Sigma\, m_x\, p_x^*}{\Sigma\, p_x^*}$$

$$= \frac{609.94}{93000} \times 1000 = 6.65$$

CDR reduced from 8.3 to 6.65

AGE SPECIFIC DR

Age	Mid year population	No. of Deaths	ASDR
0 – 1	4000	60	15.0
1 – 4	4500	20	4.4
5 – 14	4000	12	3.0
15 – 19	5000	15	3.0
20 – 24	4000	16	4.0
25 – 34	8000	25	3.1
35 – 44	9000	48	5.3
45 – 54	8000	100	12.5
55 – 64	7000	150	21.4
Total	**53,500**	**446**	

$$\textbf{CDR} = \frac{\textbf{446}}{\textbf{53500}} \times \textbf{1000} = \textbf{8.3}$$


THANK YOU
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