



Epidemiology in Health Planning

State Institute of Health & Family Welfare,
Jaipur

Epidemiology

“Study of **distribution** and **determinants** of **health related state or events** & disease in human population”

“Science of rates expressed as probability”

Epidemiology: Basic approach

- **Counts cases (events).**
- **Defines involved population.**
- **Determines rates/proportions**
- **Compares rates.**
- **Makes inferences**

Epidemiology vis-à-vis Management

- Identify Problems – Descriptive Epidemiology
- Setting Priorities - Impact, Cost and Feasibility
- Identify Causes - Analytic Epidemiology:
 - Case Control Studies
 - Cohort Studies
- Interventions - Experimental Studies
- M & E – Using Epidemiologic Measures



Why Health Managers should Know Epidemiologic Concepts and Methods ?

Why.....

- Increasing **size of populations** served by the providers,
- Understand the characteristics and **health status** of population,
- Understand the **consequences** of health care problems,
- Evidence of **impact** of health system on health status,
- The necessity of **monitoring** performance – programs and system,
- The continuous need for **restructuring** health system/program and process, and
- The development and **evaluation of public policy**



Epidemiology can *Answer* such questions:

- *Quantification by counting*
- *Order of priorities based on Incidence/ Prevalence*
- What are the *High risk groups* in population
- *Value* of early case finding(Lives saved, cost)
- What *Resources* needed
- Whether *Screening* programs be established
- *Utilization*
- *Impact- Reduction in Mortality/ Morbidity*
- Do the *Health benefits* justify the Cost (*Cost effectiveness*)



To answer, one needs to Epidemiological Skills

Health related State or events

- Epidemics / outbreaks
- Endemic levels
- Chronic diseases
- Birth defects
- Injuries
- Reproductive health
- Occupational Health
- Environmental health

Descriptive Epidemiology

Descriptive epidemiological approach attempts to describe the disease in terms of its attributes & variables and answers the questions like-

- **Who** (Person)
- **Where** (Place)
- **When** (Time)

Descriptive Epidemiology: Objectives

- To **evaluate trends** in health & disease and allow comparison among different population groups
- To provide basis for **planning**, provision and **evaluation** of services
- To identify **problems** to be studied by analytical methods

A. Distribution (Where, Who, When)

- Frequency
- Rate
- Pattern
- Time
- Place
- Person

Descriptive Epidemiology

Who?

Person:

Where?

Place:

When?

Time:



Who (Person) ? Is getting the disease

Attributes & Variables

- Age
- Sex
- Ethnicity
- Marital status
- Occupation
- Education
- Income group.....



Age



Malnutrition



Measles



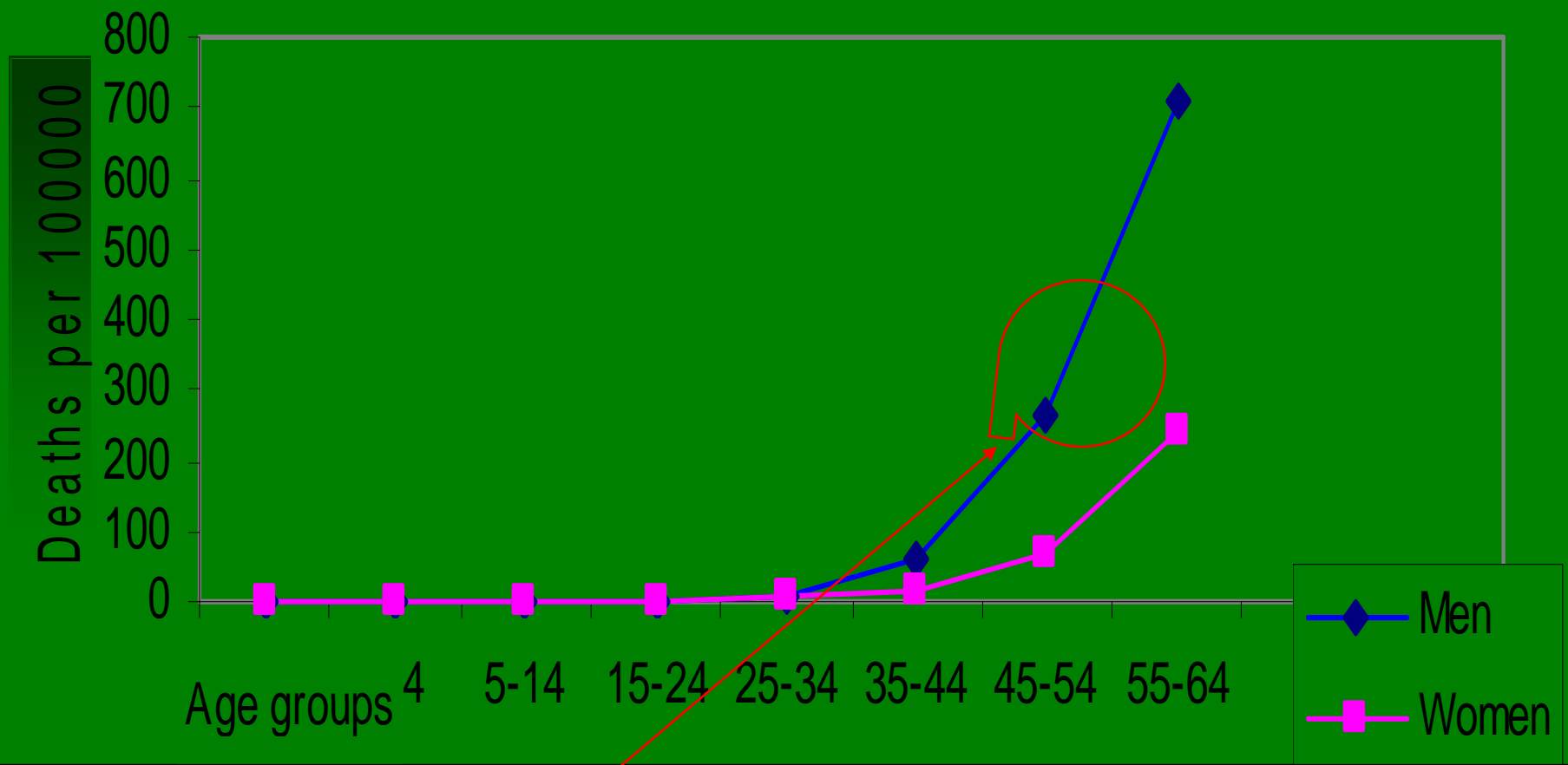
STI



Arthritis/ Cancer

Sex

Deaths per 100000 population from CAD

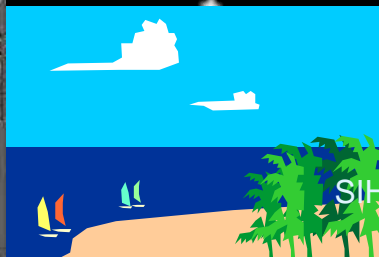
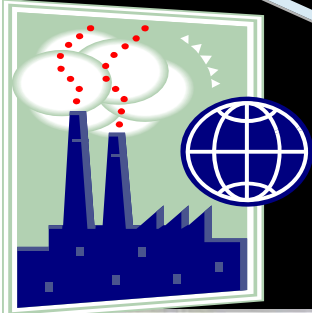
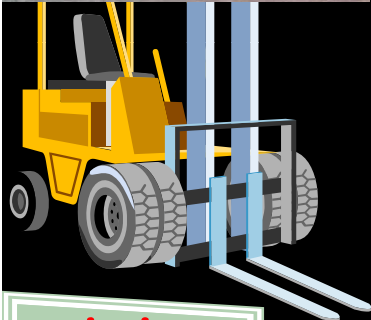


Gap starts narrowing after 54 (menopause), suggests protective effect of estrogen

Where (Place) ?

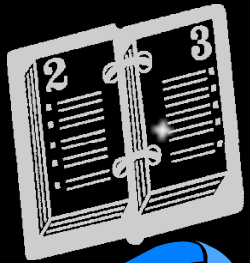
Where Rates are highest and lowest

- Residence
- Occupation/ Work place
- At specific events
- Geographic sites



Time (When) ? Reflects on trend

- Year
- Season
- Day
- Date of Onset
- Duration



Time trends

- Secular (Changes that occur over long periods of time)
- Periodic (short term)
- Cyclic (Seasonal)
- Epidemic

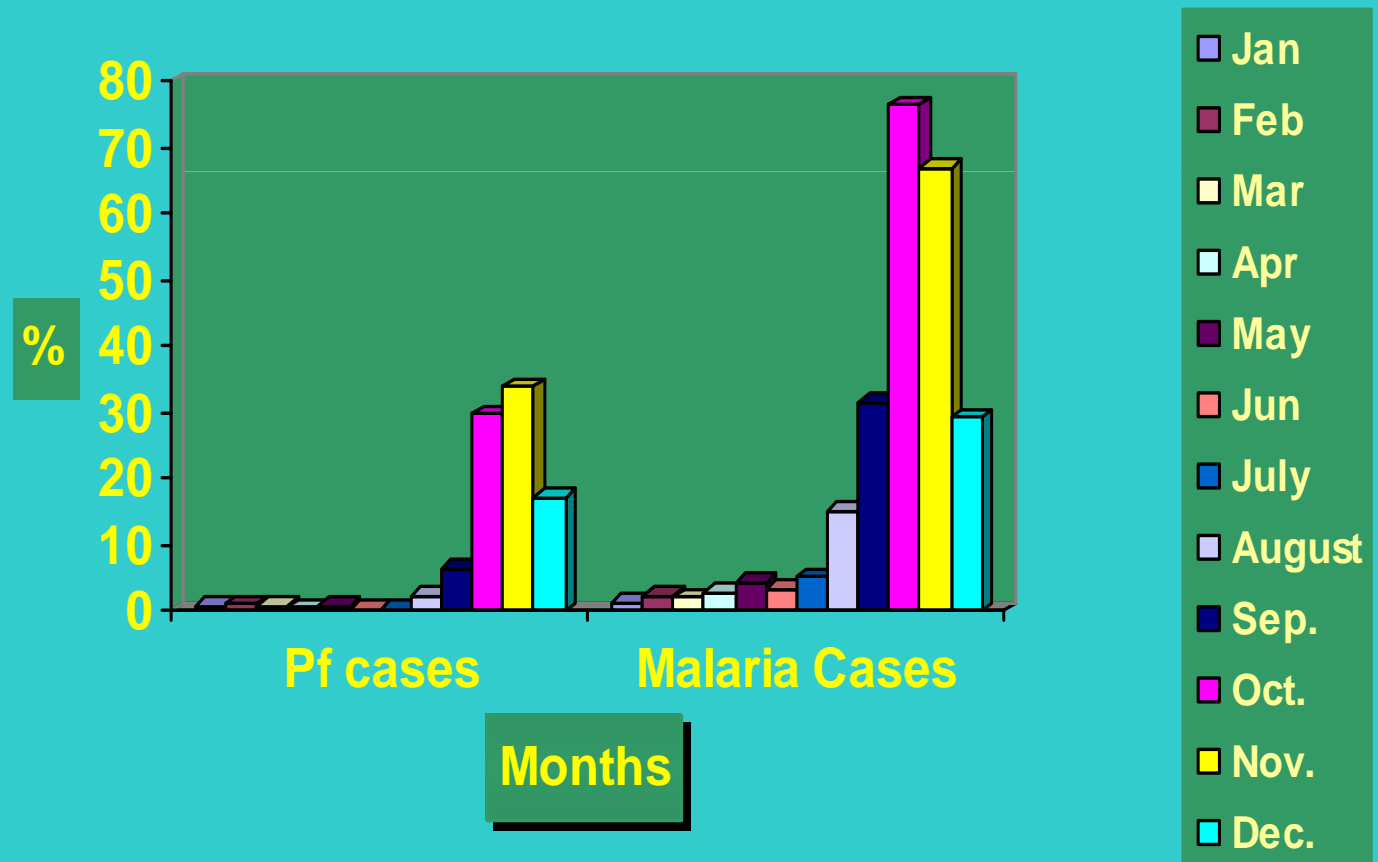
Secular trend is influenced by:

- Changes in completeness of source of data
- Changes in diagnostic ability
 - Experience
 - Techniques
- Changes in data classification approach (ICD-9 to ICD-10)
- Demographic changes in population
- Changes in environment other than that which is related to disease
- Changes in clinical concepts, Diagnosis, Terminology

Cyclic (Seasonal) trends

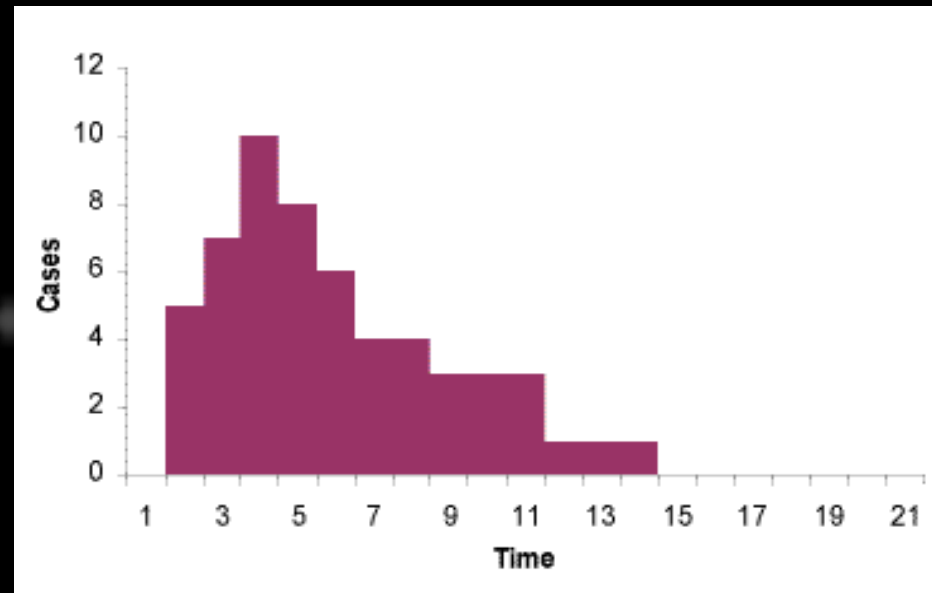
Changes in frequency over:
 Days
 Weeks
 Months
 Years

Seasonal trend-Malaria & Pf cases, 1994 Rajasthan

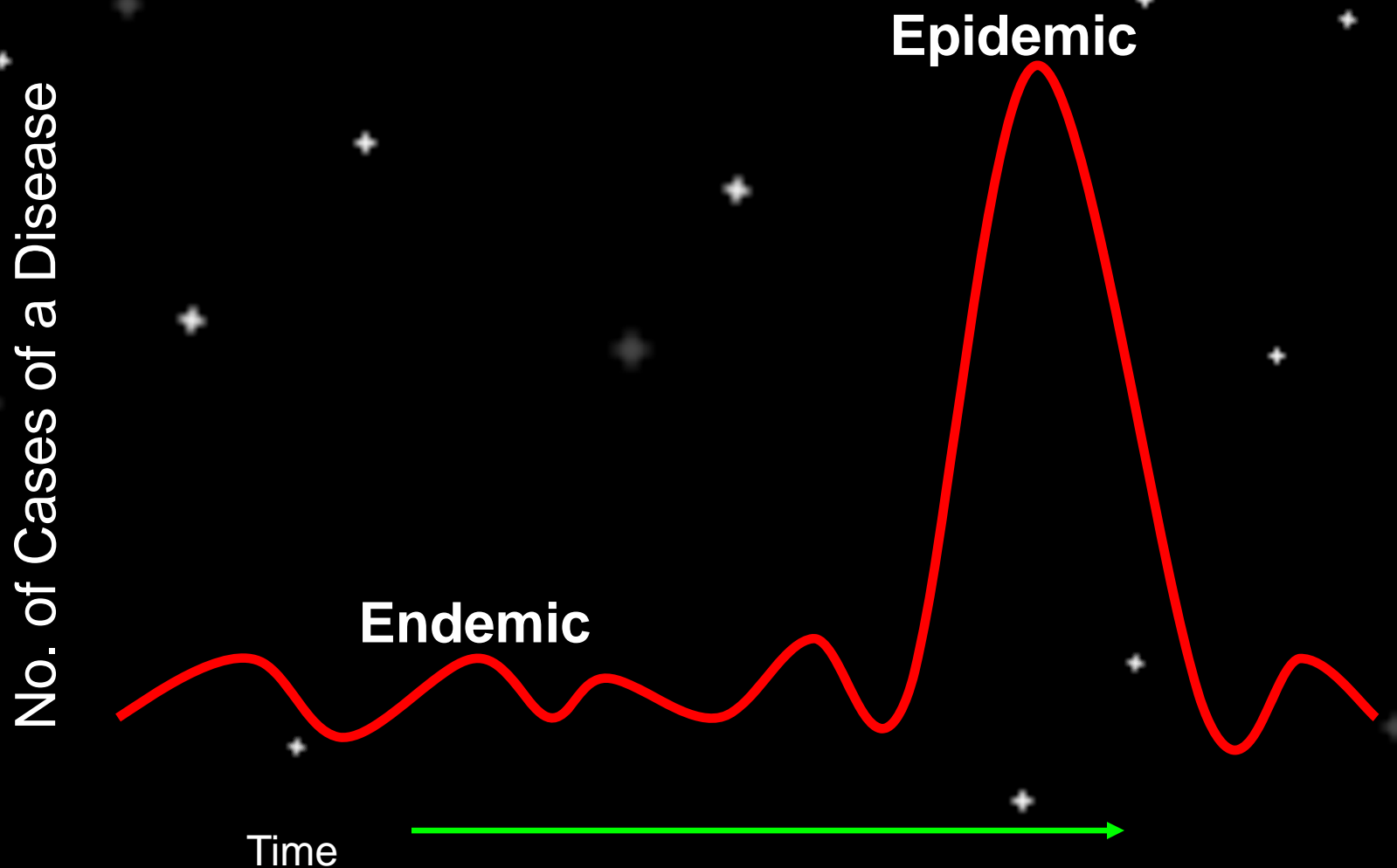


Periodic (short term)

- Changes that occur in hours/ days / weeks
- Simultaneous exposure to single source (Point source)
- John Snow- Cholera



Endemic vs. Epidemic



B. Determinants (What. Why & How)

- Demographic feature
- Risk Factors
- Genetic predisposition
- Life style & behavior
- Environmental exposures



Let us see, if we know the terms like :



Program

“a strategy with defined Objectives”

Policy

“ a written statement of objectives and expected outcomes”



Planning

- “an act or process of choosing between alternatives to accomplish preset goals”.
- denotes a blue print of action.
- The planning prerequisites are-
 - Base line of standards and performance
 - Additional resources
 - Reallocation of resources.

Goal:

“The proposed long-range benefits of the program for a specified area, defined in general terms. A goal is the ultimate objective; for example, “reducing the incidence of HIV in (a country).”

Purpose:

“The overall objective (also called strategic objective) of the program, for example, “to increase the accessibility to and use of palliative care facilities in (a particular geographic area).”

- Ultimate measure of the program’s effectiveness.

Objectives:

- The anticipated outcomes or benefits that are the expected results of implementing a strategy. They are described in measurable terms and indicate a specific period of time during which these results will be achieved.
- should be SMART

S pecific,
M easurable,
A ppropriate,
R ealistic, and
T ime-bound



Strategy

“a plan (to choose) to achieve a particular goal or result; and reveals the logic of your choices”.



Approach:

A statement that describes how the program will achieve its objective, in terms of activities, most effectively and feasibly.

Monitoring

- tracks the program's incremental steps to its effect and informs the final evaluation report.
- **A continual, routine effort** requiring data gathering, analysis, and reporting on results at periodic intervals
- **Periodic, regular**
- Focuses on **inputs, outputs, process outcomes, work plans**
- Basic purpose is **improve efficiency and adjust work plan**

Evaluation

- A technical activity that measures the **program's impact** and effectiveness as a whole.
- Evaluation is not about assigning a “grade” of success or failure at the end of a project.
- Episodic
- Focuses on effectiveness, relevance, impact, cost-effectiveness
- Basic purpose is to **improve effectiveness, impact, and future programming**

Cybernetic Planning Cycle



Environment Constraints-
Human resource
Financial
Legal
Ethical
Expectations
Value system

Situational analysis
Appraisal of interaction
between system & its
environment

Objectives:
Formulation of alternate
policies
Goals, objectives &
Priority decisions

Evaluation:
Monitoring & Evaluation
in relation to objectives

Implementation:
Execution of Plan
Collection of monitoring
data

Environment
Effect upon clients and
adjacent systems

Operational plan:
Allocation of resources
& Authority,
Scheduling activities,
Designing monitoring
system

Strategies:
Alternative programs,
Evaluation of likely
outcomes
Feasibility,
Operational choice

Planning steps

- Situational analysis
- Deciding objectives
- Defining strategies
- Laying an Operational Plan
- Implementation
- Evaluation-
 - Criteria,
 - Frequency and
 - Process

The Research-to-Policy Gap

- Large investments have been made in policy-relevant data collection and research.
- Yet, opportunities for increasing knowledge and putting data to use are often lost.
- Researchers and decision makers work in different spheres.

Researchers' Stereotypes of Policymakers

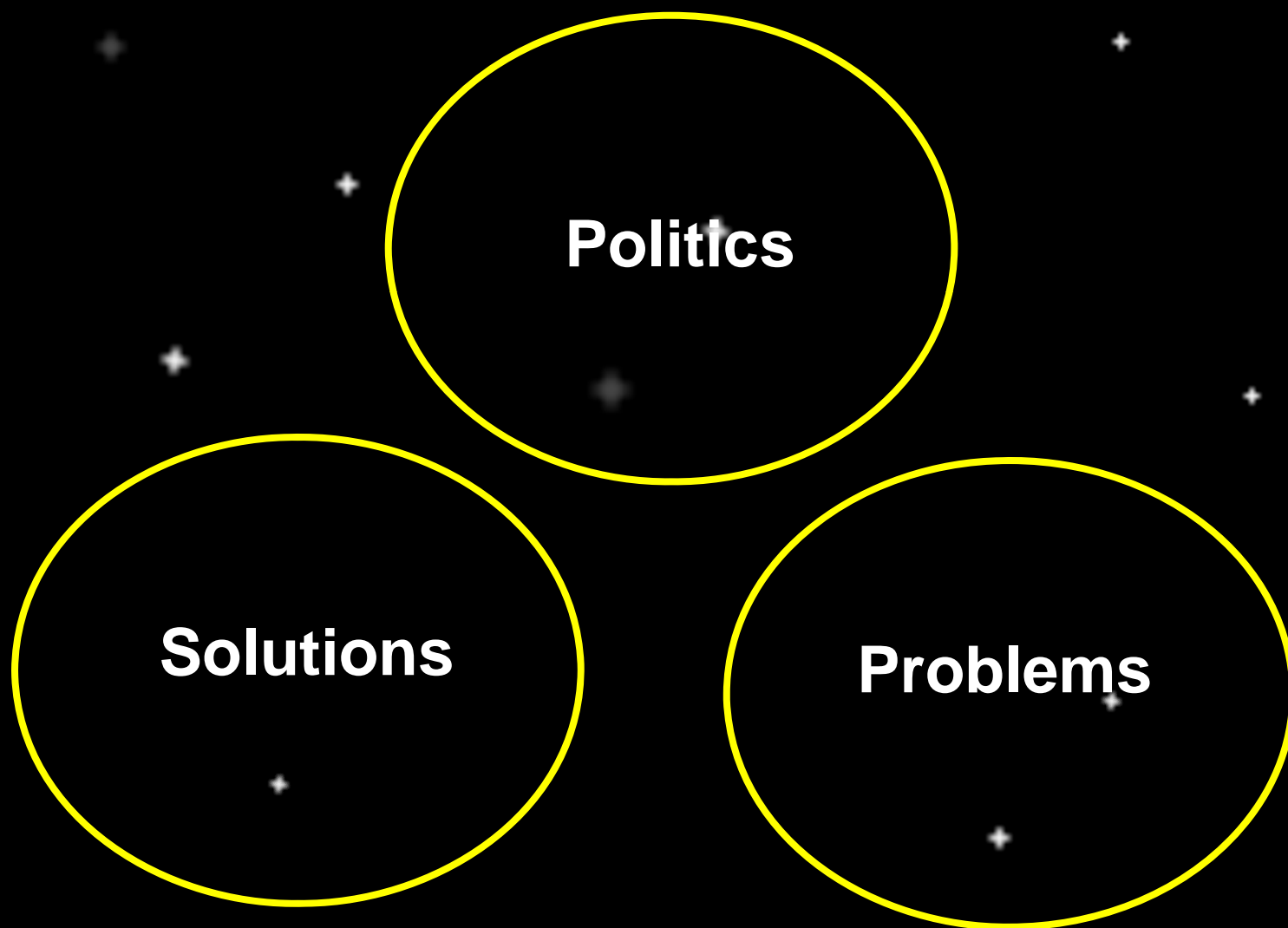
- Uninterested or too busy to read
- Reach hasty conclusions
- Actions unsubstantiated by data
- Distrust survey and research findings
- Limited perspective
- Should be responsible for drawing implications from the data

- Avoid policy implications of findings
- Prone to professional "faddism"
- Excessive use of technical jargon
- Inconclusive generalities about broad theoretical matters
- Little appreciation of real problems and data needs

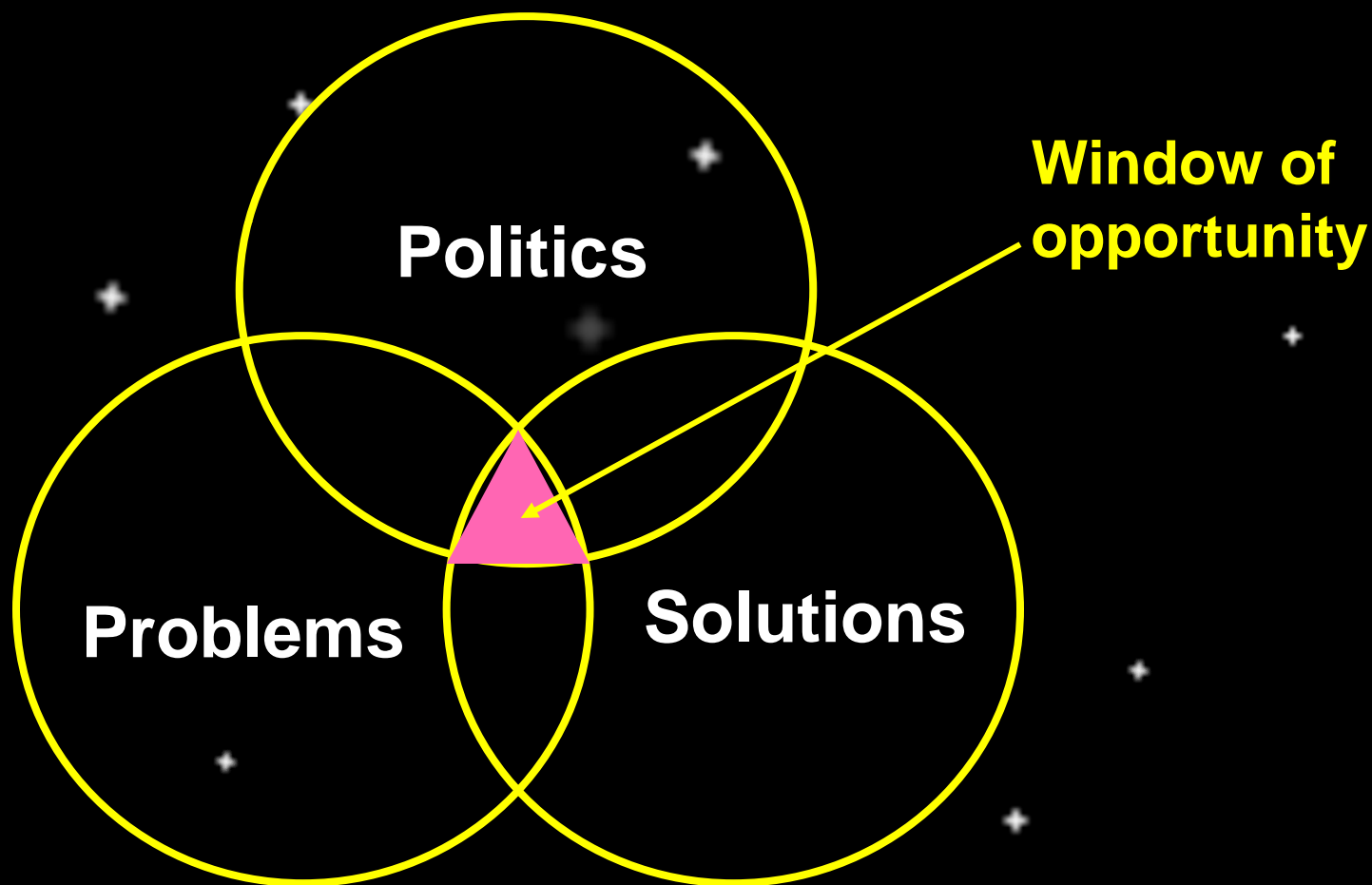
Assumptions about Decision-making

- Researchers may assume that policymakers:
 - Practice rational decision-making
 - Prioritize goals and objectives
 - Examine alternative solutions systematically
 - Choose alternatives that maximize goals

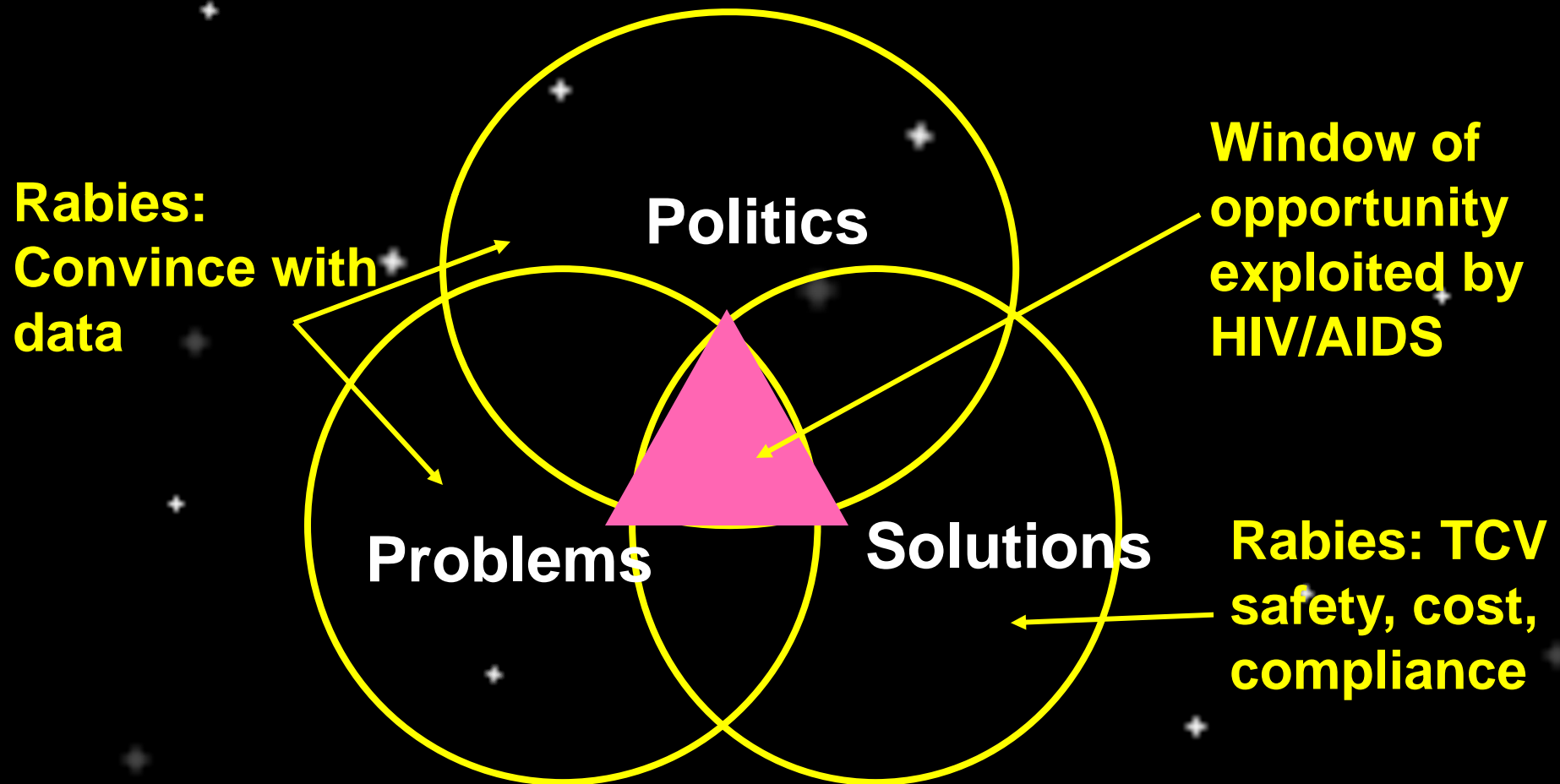
Polycymaking is Not Linear



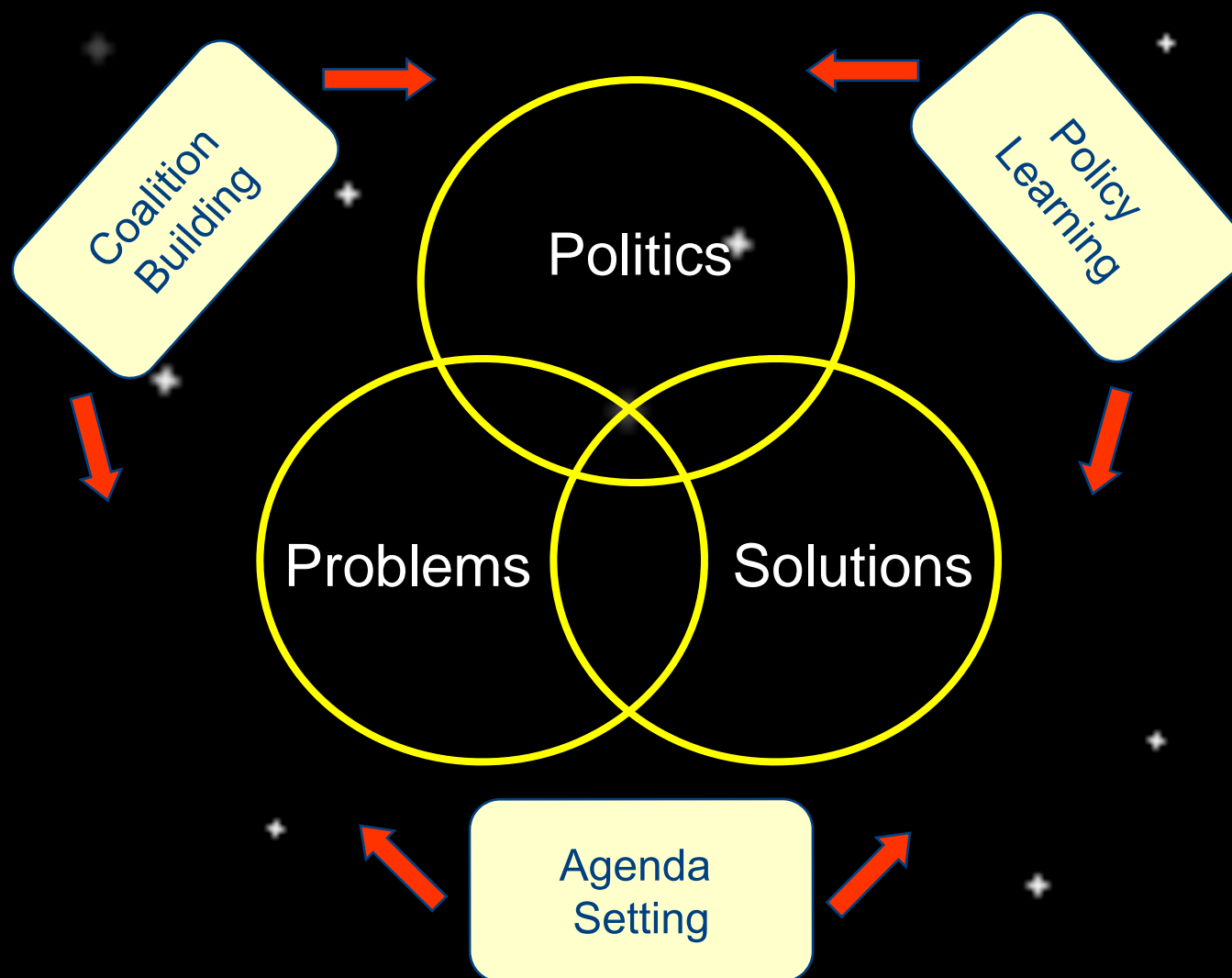
A Window of Opportunity for Policy Change



Using opportunity



Moving the Spheres Together





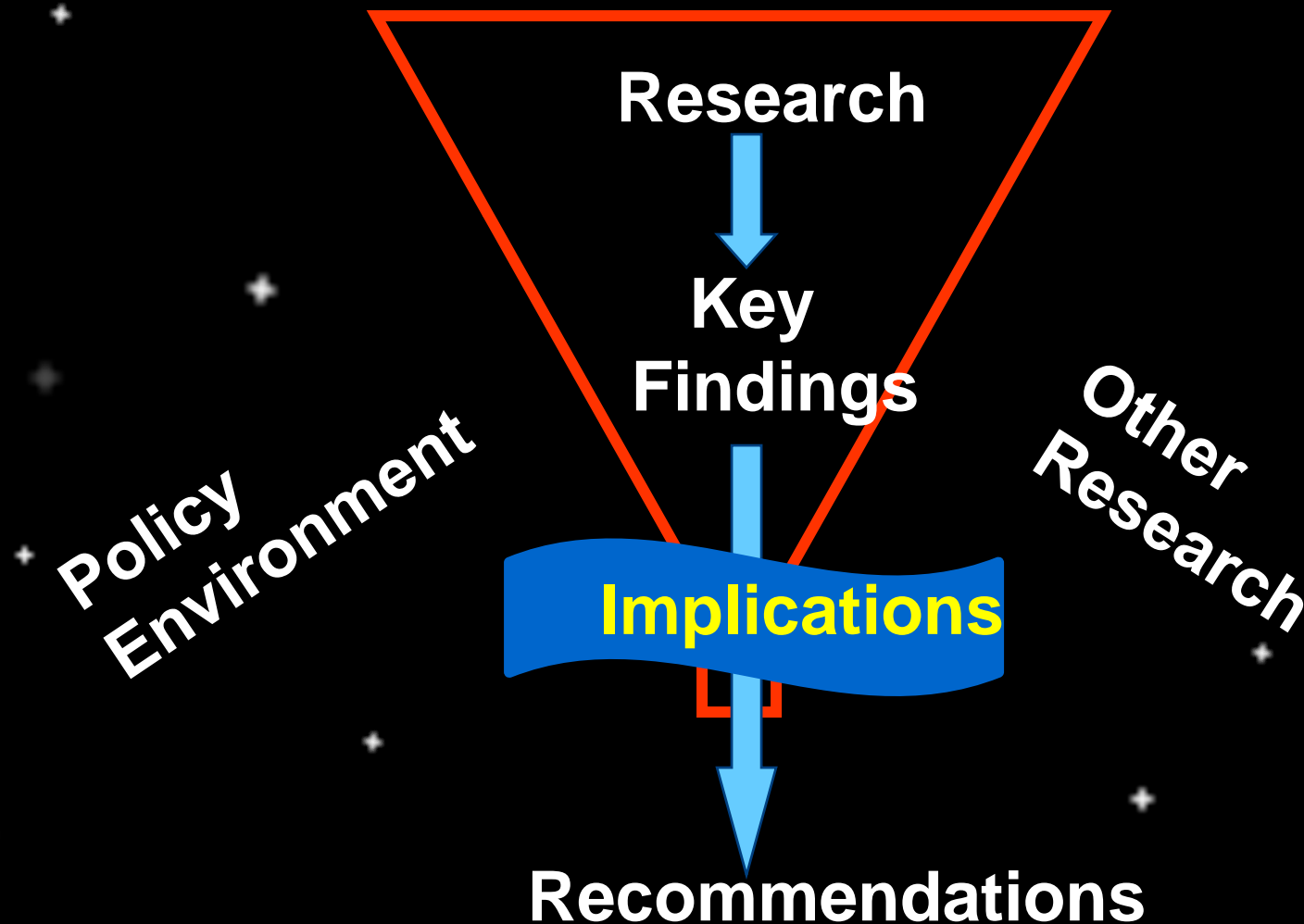
Characteristics of Issues that Get on the Policy Agenda

- Clear, measurable indicators
- Policy champions
- Feasible policy or program alternatives
- Attention-focusing events

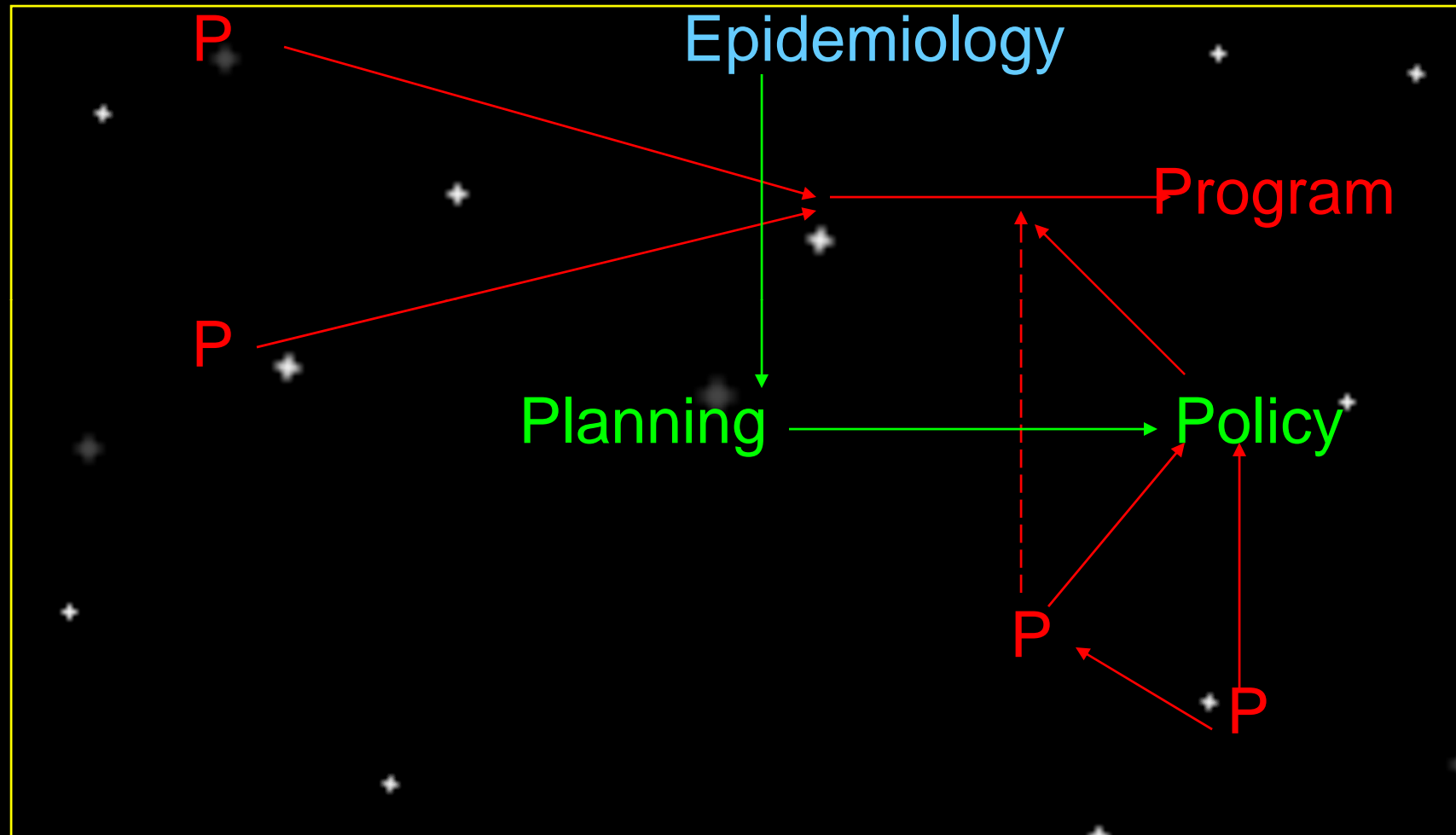
Crafting the Policy Message

- ★ Policy communication messages
 - derive directly from the data
 - help decision makers to understand policy implications and to make grounded policy recommendations.

Research to Recommendations



Health Programs:





Population
(Morbidity/Mortality)

Epidemiology

Services &
performance

Records/Reports

Quantifiable public
Health priority

Problem

Program

Provisions

Planning

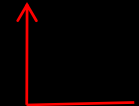
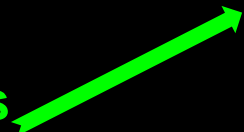
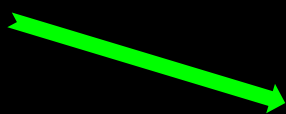
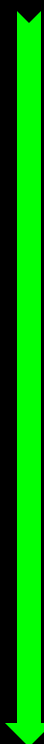
Policy

Machines (Diagnostics)
Manpower (Doctors)
Medicines (Drugs)
Money (Dollars)

Political Commitment

Pressure (Donor initiative)

SIHFW-an ISO 9001:2008 certified Institution



- NO Health Policy for 36 years
- Health left to **Committees and Commissions**
- Each Committee addressed to a **single** specific issue.
- **Comprehension** missing
- Majority of recommendations of every committee were **reiterations** of Bhore Committee.
- Individual “Health” Programs developed in isolation based on situational **exigency**.
- Uni-purpose workers later baptized as Multi-purpose.
- Some Programs worked in complete **isolation** till 1980 (e.g. NTCP).
- **Fragmented approach to Health**

Health Planning

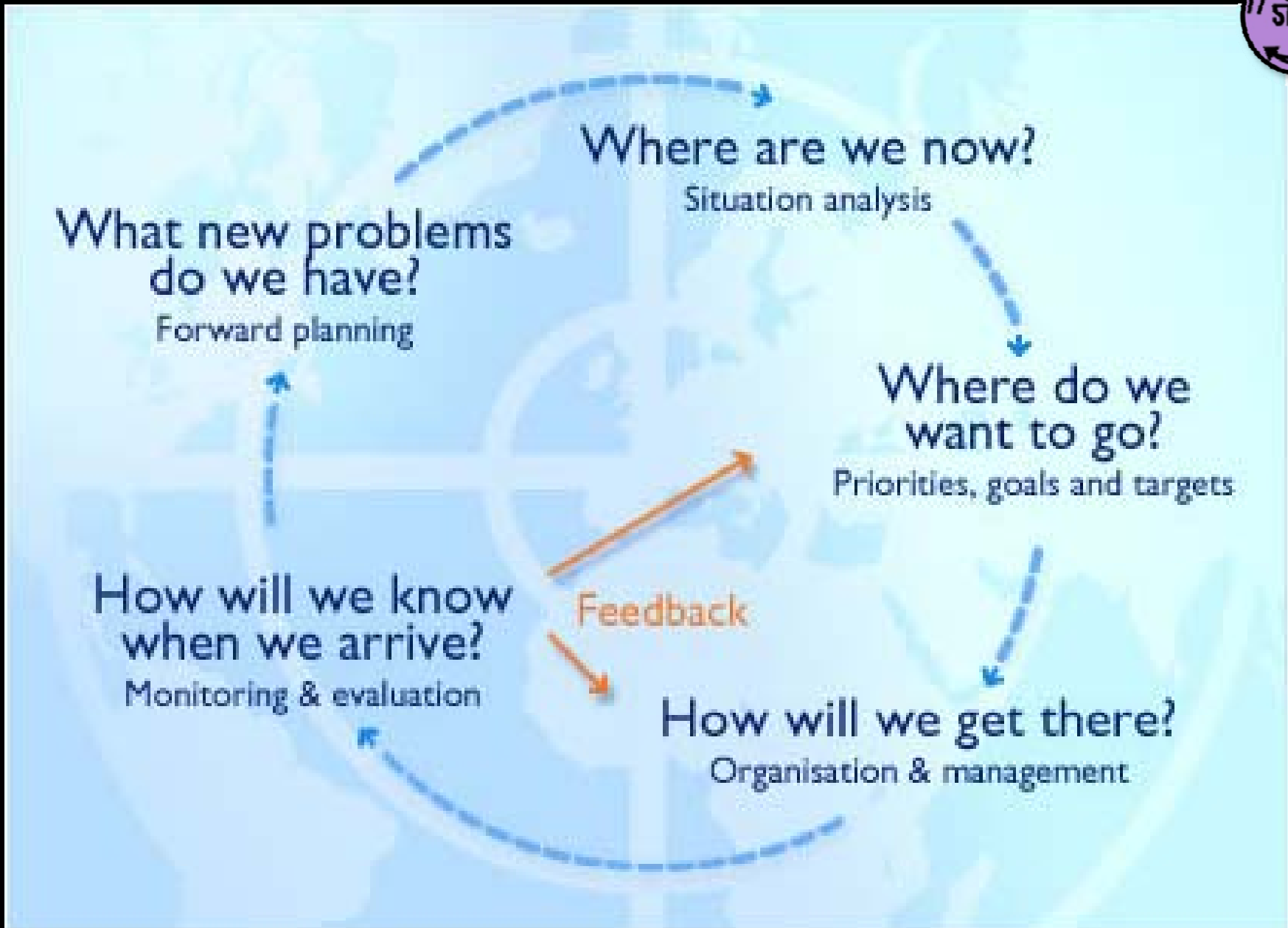
“ The orderly process of defining community health problems, identifying unmet needs and surveying the resources to meet them, establishing priority goals that are realistic and feasible and projecting administrative action to accomplish the purpose of the proposed programme.”

Health Planning

- **Measurement** or assessment of burden of illness
- **Identification** of cause of illness
- Measurement of **effectiveness** of different community interventions
- **Assessment of efficiency** of interventions in terms of resources used
- **Implementation** of interventions
- **Monitoring** of activities
- **Reassessment** of burden of Disease to see if there is any change

The planning process in health

Where are we?	Situational analysis
Where do we want to reach?	Goals, Objectives, priorities, Targets, and strategic decisions
How will we get there?	Organizational constraints, resources & organizational structure, functions & management
How well we have done?	Monitoring evaluation & feedback
What new problems do we have?	Re-planning



What new problems do we have?
Forward planning

Where are we now?
Situation analysis

Where do we want to go?
Priorities, goals and targets

How will we know when we arrive?
Monitoring & evaluation

Feedback

How will we get there?
Organisation & management

Health planning in India

- Bhore, 1946
- FYPs
- Mudaliar , 1962
- Chadhah , 1963
- Mukerji , 1965
- Mukherji , 1966
- Jungalwalla, 1967
- Kartar Singh, 1973
- Srivastava, 1975
- Rural Health Scheme, 1977
- NHP, 1983, 2002
- NPP, 2000

Epidemiological Profile of Malaria → NMCP (1953) → NMEP (Vector Surveillance, (1958)

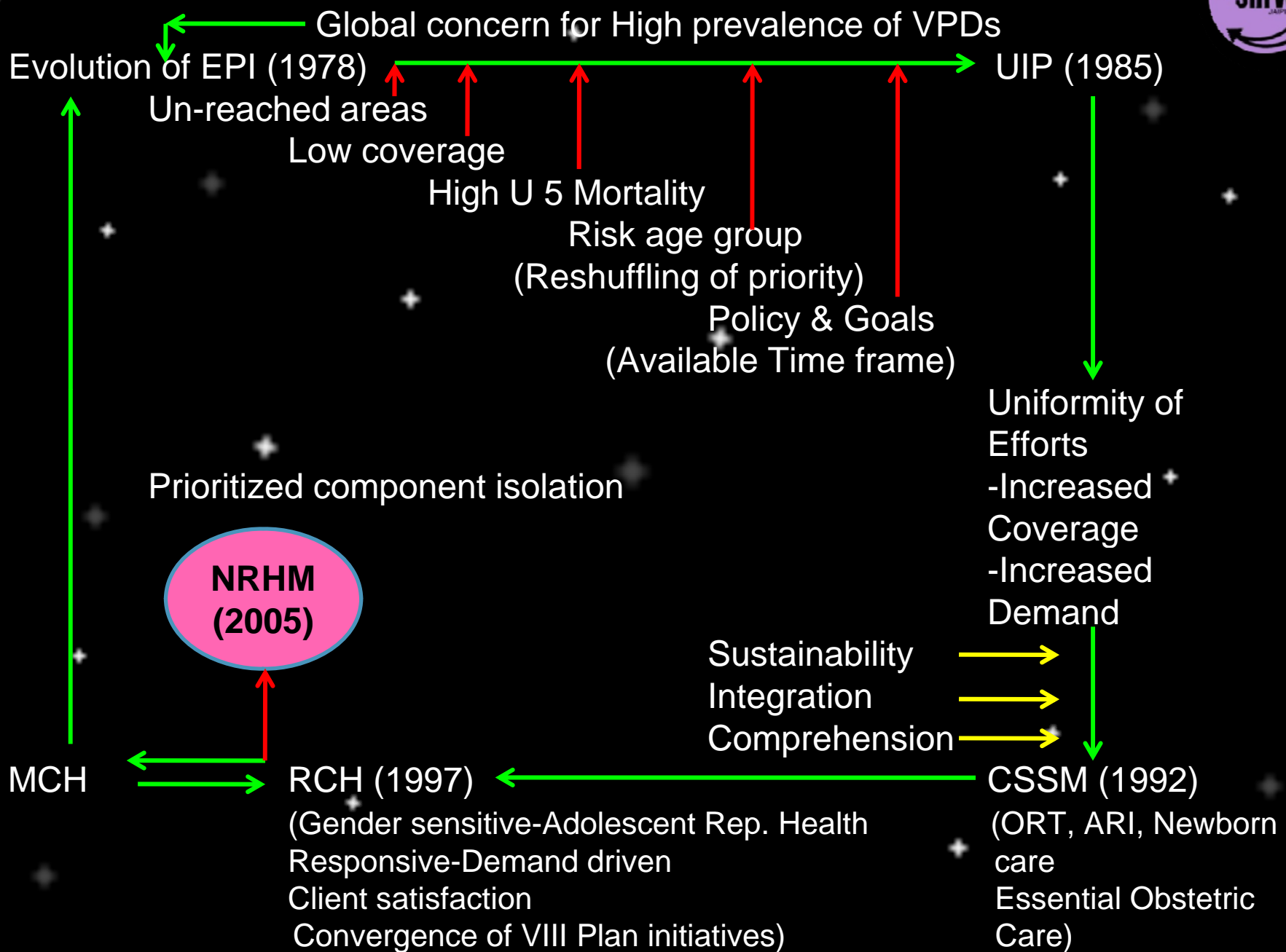
Insecticides resistance
Drugs resistance
Complacency &
Shift in Priority

Cases-50000(1961) to 6.4 M (1976)

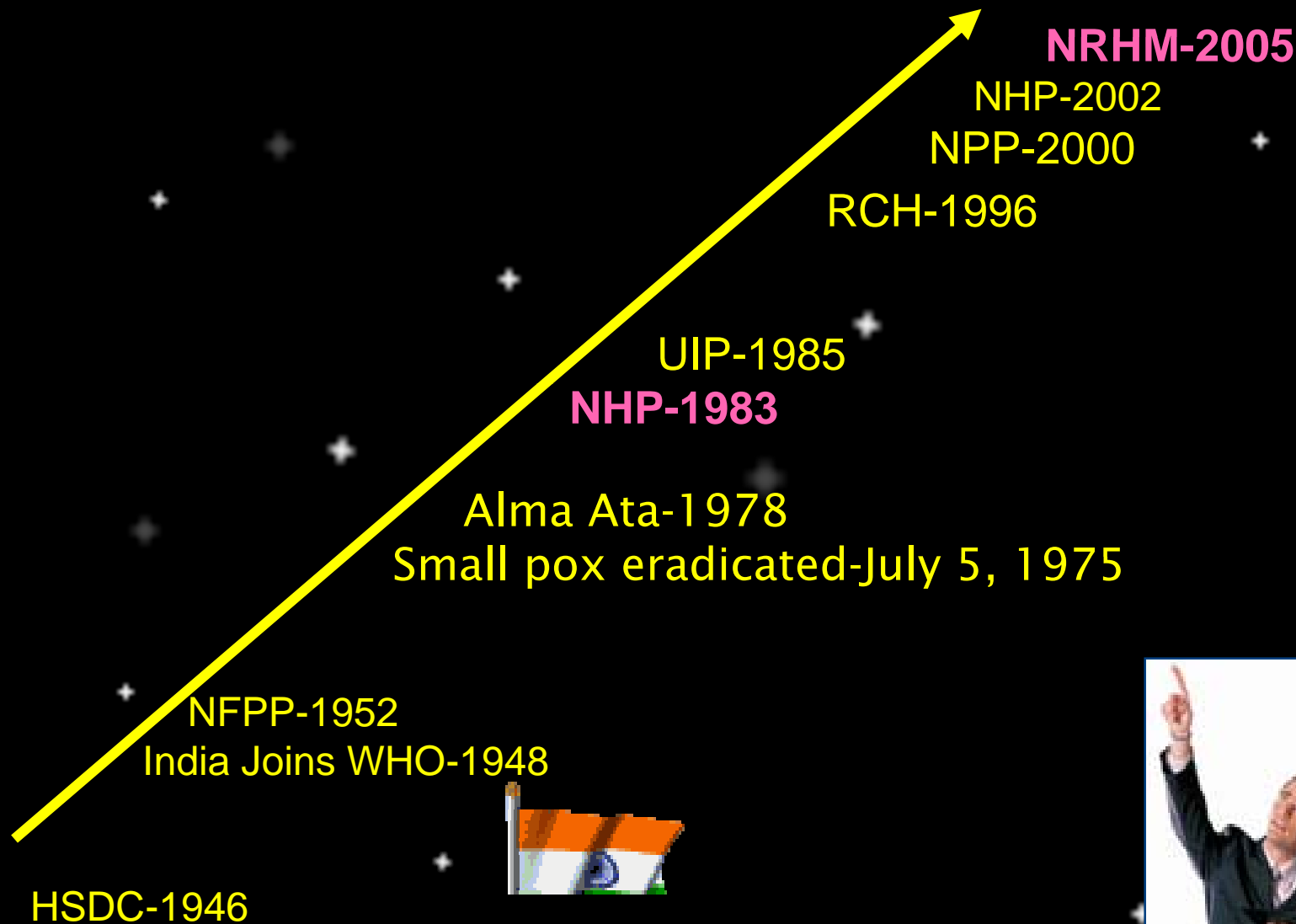
Resurgence (1994)

Malaria Action Plan
(Case Management
Reducing Mortality & Morbidity
Falciparum containment
Epidemic control
High risk groups)

Malaria Plan of Operation (1977)
(Surveillance
FTD
DDC
UMS
Spray in areas with API > 2)

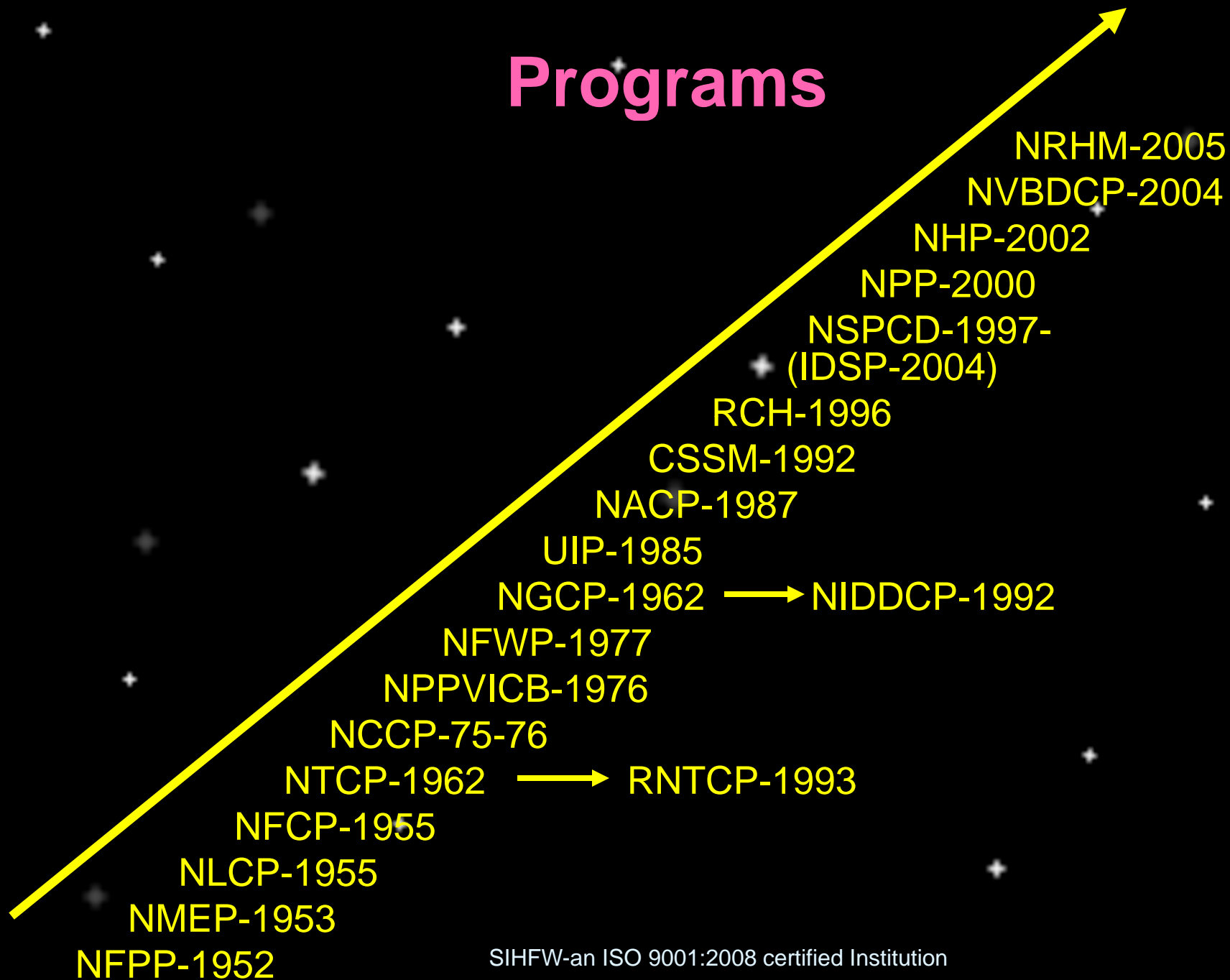


Mile stones





Programs



In the process, we need Data,
based on descriptive epidemiology
generated during-

Service delivery

Surveys

Studies

From where do I do get Data

1. Census
2. Civil Registration System
3. Vital Registration System
4. Sample survey
5. Demographic Health Surveys
6. Epidemiological investigations
7. Service delivery-
 - a. SDR
 - b. C-E register
 - c. EC register

Common data used in Planning

- Demographic profile
- Health system
 - Infrastructure
 - Human Resource
 - Financing
- Morbidity/ Mortality
- Performance Indicators



Counting Tools: How are data expressed

- Rate
- Ratio
- Proportion

What is a rate?

“a measure of speed with which events are occurring in a population in a specified time period.”

- A numerator
- A denominator that “appropriately” relates the numerator to population at risk
- A “unit” such as per 1000, per 100,000 or per million

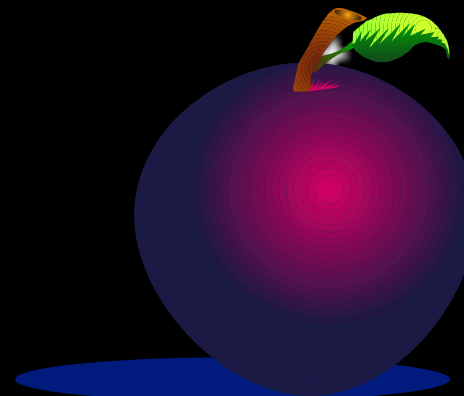


Why a rate?

To ensure comparing apples with apples

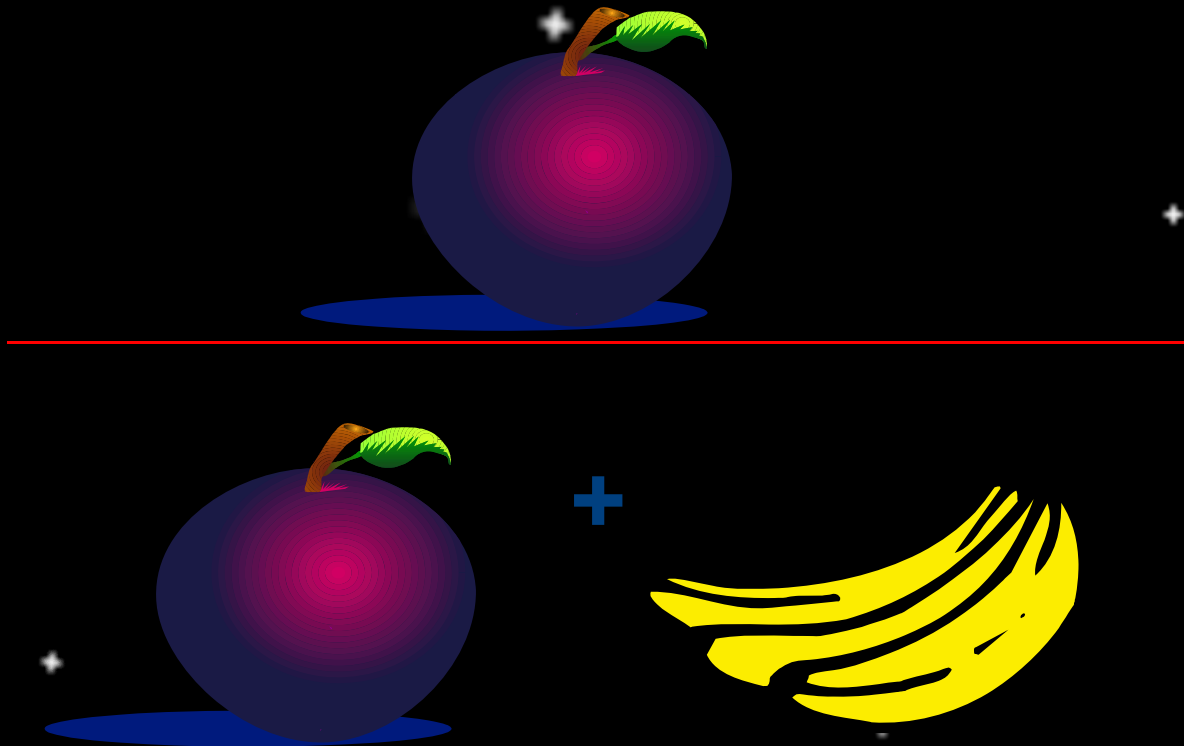
Ratio:

“a fraction (a/b) of two mutually exclusive groups with elements “a” & “b”.



Proportion:

“a fraction ($a / a + b$) of two mutually exclusive groups with elements “a” & “b”



Index	Numerator	Denominator
Proportion	People with disease	All people with & without disease
Ratio	People with disease	People without disease
Rate	People with disease in a <i>given period</i>	All people with & without disease

Counting diseases

- Mortality
 - Tools
 - Crude Mortality
 - Case fatality
 - Proportional Mortality
 - Standardized Mortality
 - Age specific Mortality

- Morbidity
 - Tools
 - Prevalence
 - Incidence

Morbidity Measuring: Prevalence–

Prevalence -

Total no. of cases
(new + old)

----- x 100

Total population over specified period

Point prevalence

Period prevalence

Prevalence rate- a Ratio, reflects status

Population at Risk – in a study of Cancer cervix

Total Population



All Women



Pop. At Risk



Only Pop. At risk should go into denominator of Prevalence rate but at times it is the total population that is considered

Prevalence:

Prevalence can be expressed either as a proportion or as a rate

Expressed as a proportion, prevalence is a number between 0 and 1

As a rate, prevalence can be expressed as per 1000, per 100,000, or per whatever

Prevalence-Types

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

So far as prevalence is concerned it generally refers to point prevalence. However when the period of observation is large it is referred as period prevalence where the numerator will have all existing cases plus all new cases occurring during period of observation and denominator will be mid year population

Prevalence: Example

In a sample of 1,038 women (70-74 years), 70 were found to have rheumatoid arthritis.

The prevalence of arthritis is:

70

$P = \frac{70}{1,038} = 0.07$ per women (70-74)

1,038

Or

$P = 70$ per thousand women age 70-74

Or

$P = 7$ percent for women age 70-74

Or.....

Prevalence:

Choice of scale of rate usually depends on the **ubiquity** of the disease.

Thus, more **common** disease prevalence may be presented as **percentage**

Rare disease prevalence may be presented as per **100,000** or per **million**

In 2004 there were 1076 cases of Tuberculosis in District X among 50000 men in age group of 40-44 years.

The Prevalence rate will be:

$$p = \frac{1076}{50000} = 0.0215 \text{ per year}$$

= 21.5 per thousand per year
= 215 per 10 thousand per year
= 2150 per million per year

Change in Prevalence reflects

- Change in incidence or duration of disease
- Introduction or impact of an intervention
- Selective attrition
- Change in disease definition or classification
- Significant migration

Prevalence has its use in –

1. Determination of the sickness load
2. Planning of health services in relation to
 - a. Infrastructure
 - b. Manpower
 - c. Facilities, and
 - d. Finances
3. In making community diagnosis

Incidence Rate

number of new cases occurring during
a period of time

$$I = \frac{\text{number of new cases occurring during a period of time}}{\text{“total person time” at risk}} \times 100$$

What is “person time”:

The duration of time a person is at risk

**Usually expressed as person years
but can be expressed as anything,
e.g., person months, person weeks,
etc.**

Incidence Rate-Types

- Cumulative Incidence (CI)=

New cases

----- X 100

Population at risk (PAR) during a specified period

- Incidence Density (ID)/ Incidence rate=

New cases

----- X 100

**Total Person time of observation in PAR,
over a specified period**

“Total Person Time”

Sum of person time of all individuals who were at risk and were available for observation.

Equivalence of “total person time”

50,000 person years

= 5,000 persons observed for 10 years

= 1,000 persons observed for 50 years

= 10,000 persons observed for 5 years

In 2004 there were 1139 cases of Measles in Jaipur (Pop.-2500000, children- 15%) among children 0-5 years. The number of person years was 375000.

The incidence rate will be:

$$I = \frac{1139}{375000} = 0.00317 \text{ per person per year,}$$

or = 3.17466 per thousand per year,

or = 31.7066 per 10 thousand per year,

or = 3170.666 per million per year

To be more accurate, we must add another qualifier, namely, “for children 0-5 years of age”

This would mean exclusion of

- a. people currently having disease
- b. people who had had the disease
- c. people who are protected on account of-immunization, habits and earlier intervention;

from the population at risk

Incidence Rate: Expressed as–

Morbidity rate-

New cases\total population at risk

Mortality rate-

No. Of deaths due to a disease\total population

Case fatality rate-

No. Of deaths due to a disease\total no. Of cases of that disease

Attack rate-

No. Of cases of a disease, not persons / total population at risk for a very short period

Change in Incidence reflects

- Introduction of a new risk factor
- Changes in habits
- Change in virulence
- Change in intervention strategy
- Selective migration

Incidence useful in

- surveillance
- understanding etiology & pathogenesis, &
- planning of new services

Prevalence V/S Incidence

Prevalence:

A “snapshot” of disease at a point in time in a population

Incidence:

A description of how new cases of disease are occurring. “force of morbidity” “rate of flow” of cases from non disease to disease state

Prevalence (P) and Incidence (I)

$$P = I \times d$$

d=duration

If the disease is stable, that is, if the incidence and duration remains constant over time.

Pop. On Jan 1,
2004= 25000

July 1,
Mid Year

Dec. 31




Migrated out

Died

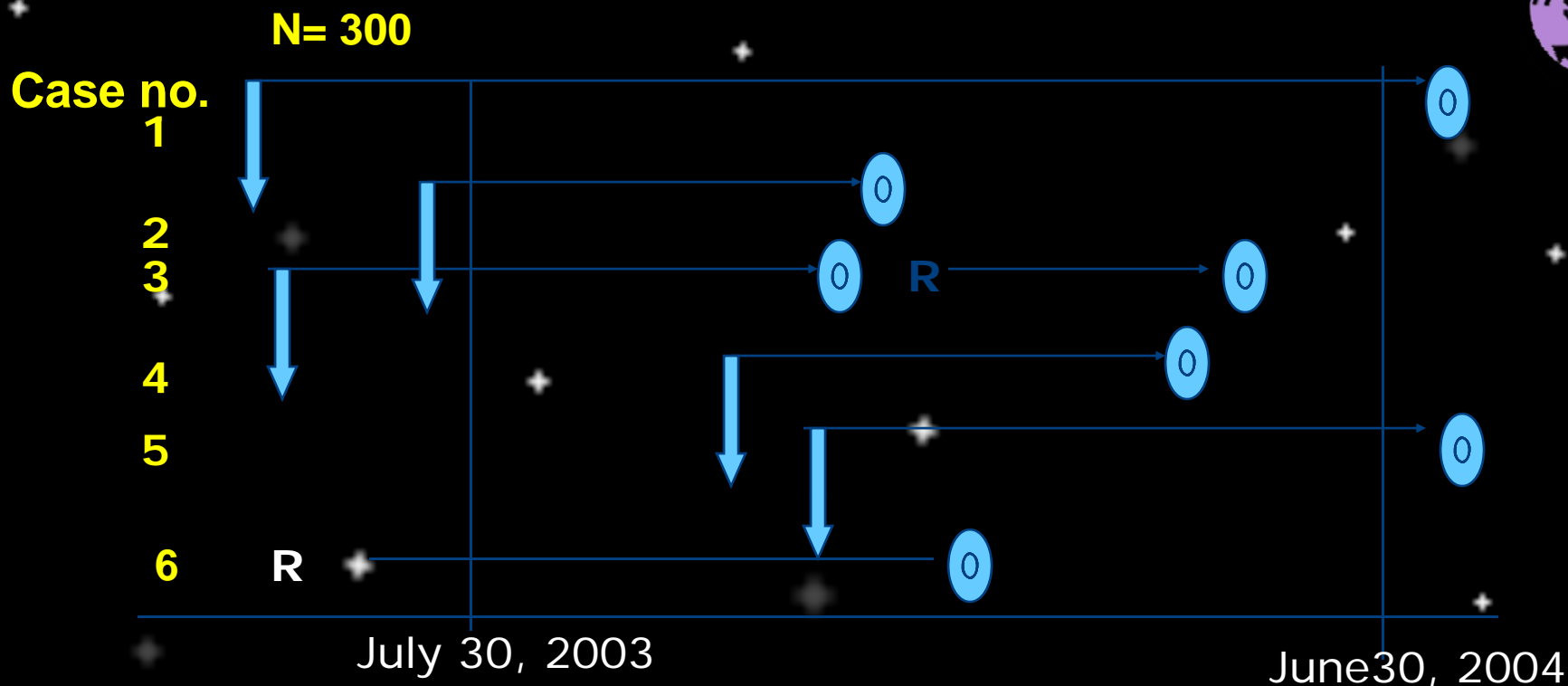
Migrated out

Died

 =100 Cases



- **Point prevalence** on Jan.1, 2004 = $400 / 25000 \times 100 = 1.6 \%$
- Point prevalence on July, 1, 2004 = $600 / (25000 - 200) \times 100 = 2.41 \%$
- Point prevalence on December 31, 2004 = $400 / (25000 - 400) \times 100 = 1.62$
- **Period prevalence** in one year = $(400 + 1100) / (25000 - 200) \times 100 = 6.51\%$
- **Cumulative Incidence** for the year (Jan.1, 2004-December 31, 2003) = $1100 / (25000 - 400) \times 100 = 4.47$



R = Date of recurrence

↓ Date of Onset of disease

○ Date of Termination or death

Point prevalence on July 30, 2003= 4 cases(1, 2, 3, 6) / 300

Incidence rate on July 30, 2003= 2 cases (4, 5) / 296

Period prevalence between July 30, 2003 to June 30, 2004= 6 / 300

Prevalence V/s Incidence

Prevalence:

Relevant for planning of health services

Incidence:

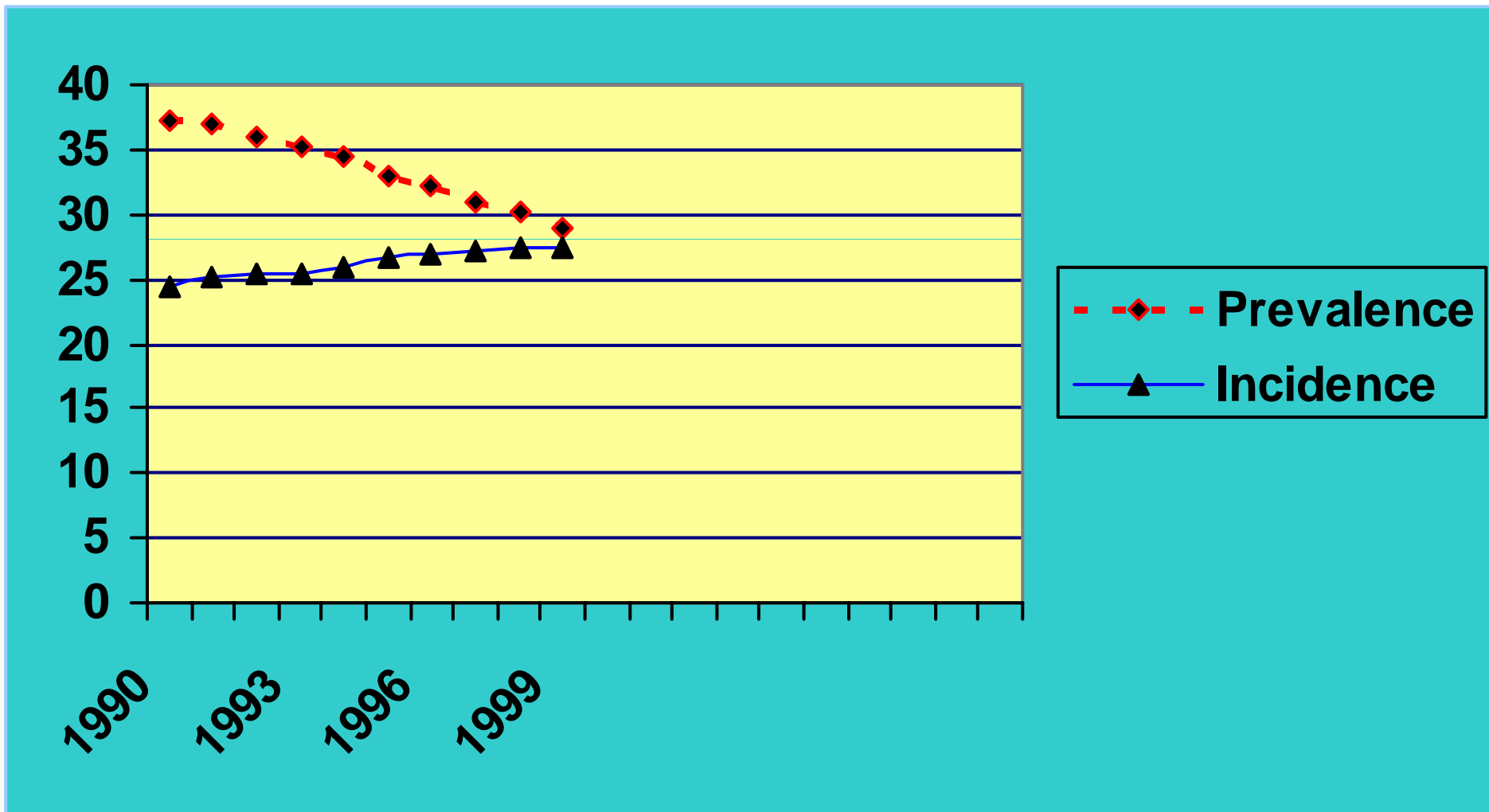
Relevant for exploring causal theories

Incidence & Prevalence

Rate	Type	Numerator	Denominator
Morbidity	Incidence	New cases	Total PAR *
Mortality	Incidence	Deaths due a disease or all causes	Total population
Case fatality	Incidence	Deaths due to a disease	No. of case of that disease
Attack rate	Incidence	No. of cases of disease	Total PAR for limited period
Period prevalence	Prevalence	No. of Cases New + Old	Total population

* population at risk

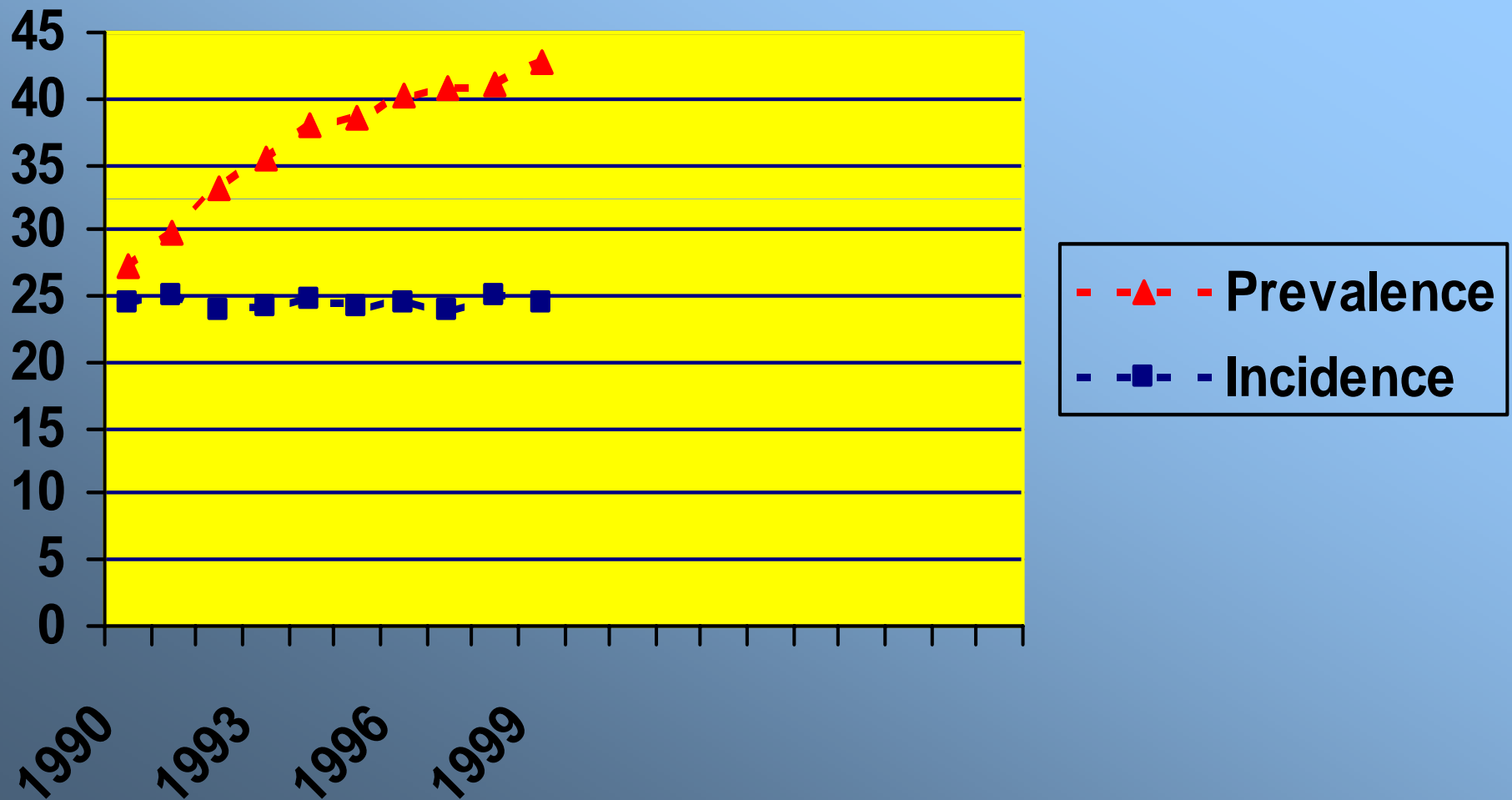
Incidence increasing but prevalence decreasing



Interpretation:

- # Disease duration is reduced and it is becoming acute, or
- # Disease becoming more fatal

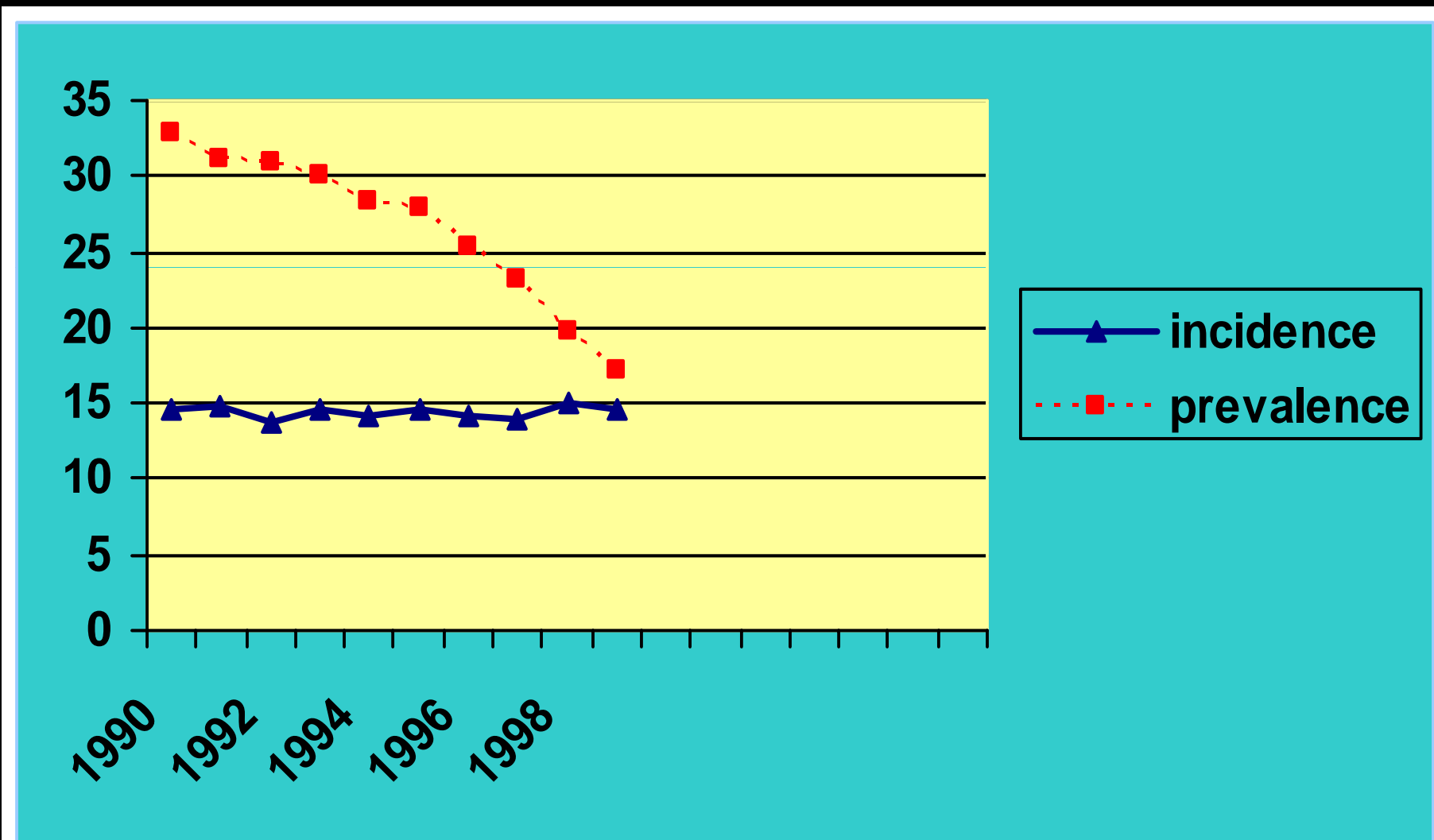
Incidence stable but prevalence increasing indicates:-



Interpretation

1. Slow recovery (disease becoming chronic, drugs less effective) or,
2. Fatality reduced (potent drugs available, new drugs effective) or,
3. Immigration of cases from other area (for better facility available).

Incidence maintained but prevalence declining means:-



- # Recovery is becoming rapid, (may be a new drug identified is more effective)
- # Disease turns into a more fatal one (because of treatment failure, change in virulence, drug resistance) or,
- # Selective emigration of cases (to seek treatment elsewhere)

When I plan, I need

- Knowledge
- Data
- Resources

- Knowledge:
 - Whom I am planning for
 - What am I planning for
 - What do I need to know

- I need Data on-
 - Demographic profile
 - Morbidity Mortality profile
 - Performance –Rates and Ratios from past

- Resources-
 - What is available
 - Can it be generated
 - How can I use it
 - How much is available for an activity



Thank You

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or
contact : Director–SIHFW on
sihfwraj@yahoo.co.in