Epidemiology in Health Planning

State Institute of Health & Family Welfare, Jaipur

Epidemiology

- Study of distribution and determinants of health related state or events & disease inhuman 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

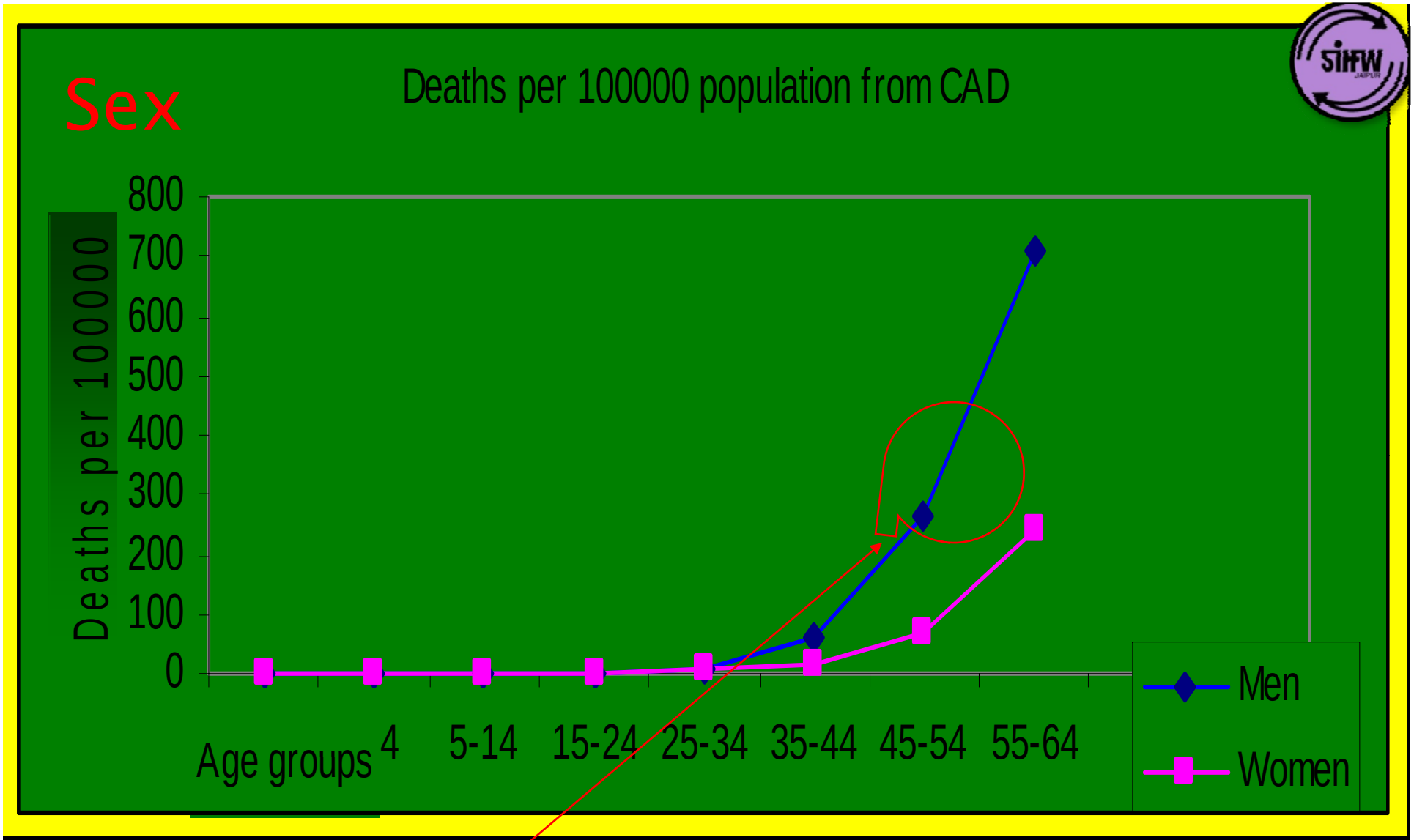
Malnutrition

Measles

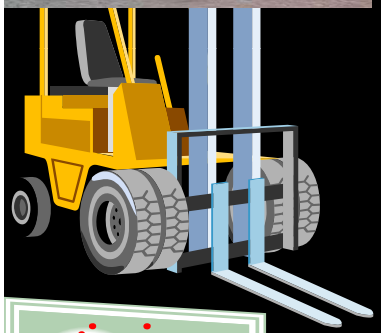
STI

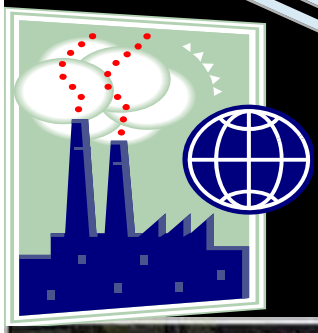
Arthritis/ Cancer

Sex



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



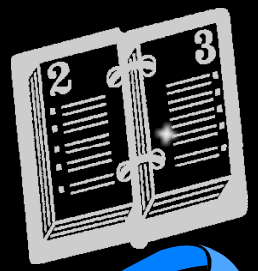


Where (Place) ?

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

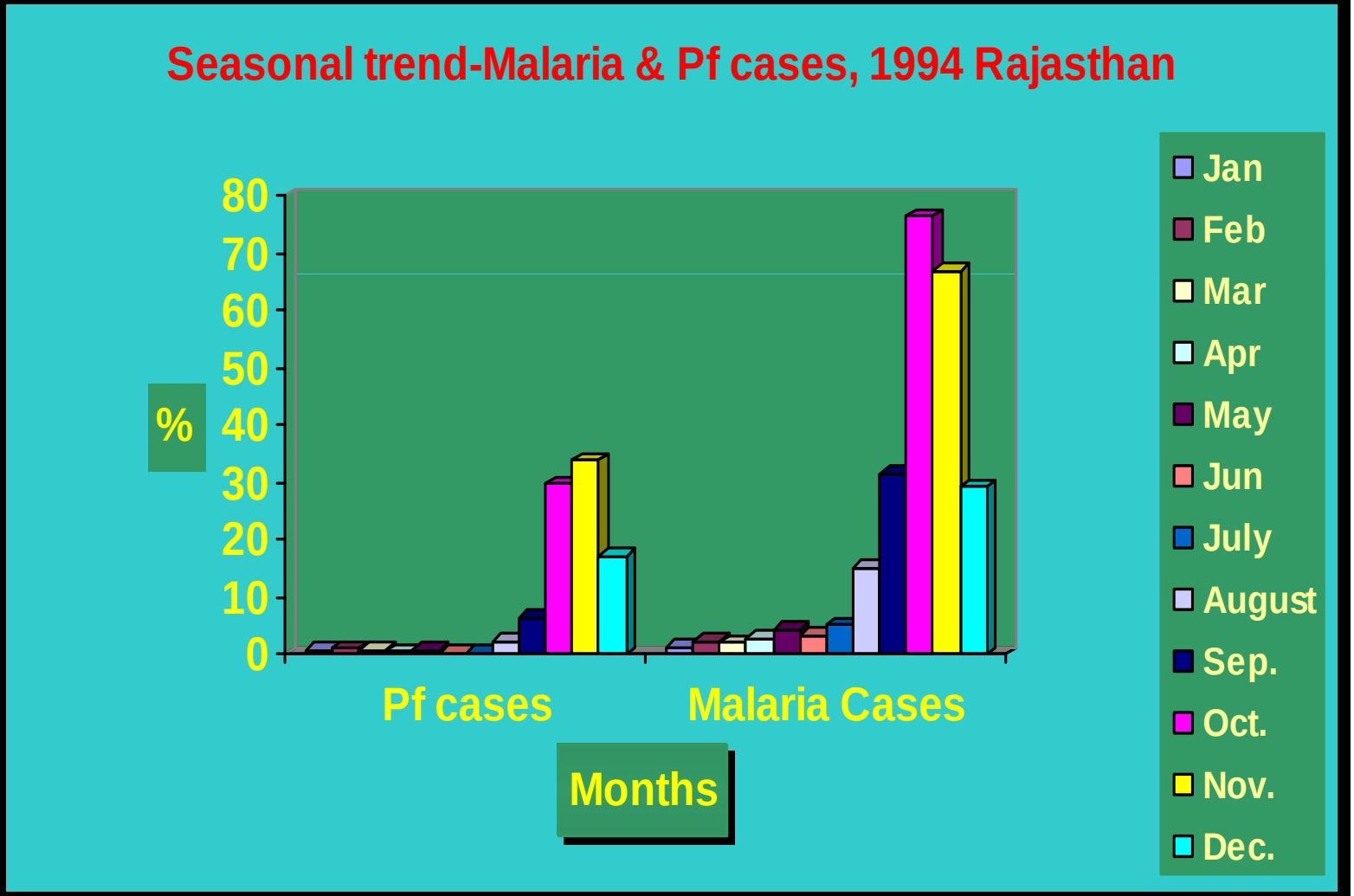
Changes in frequency over:

Days

Weeks

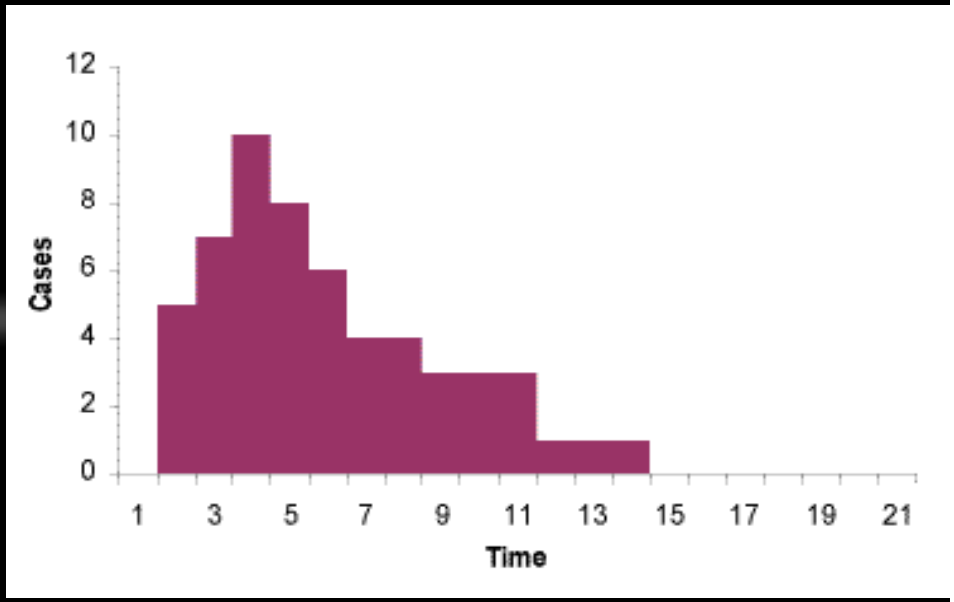
Months

Years

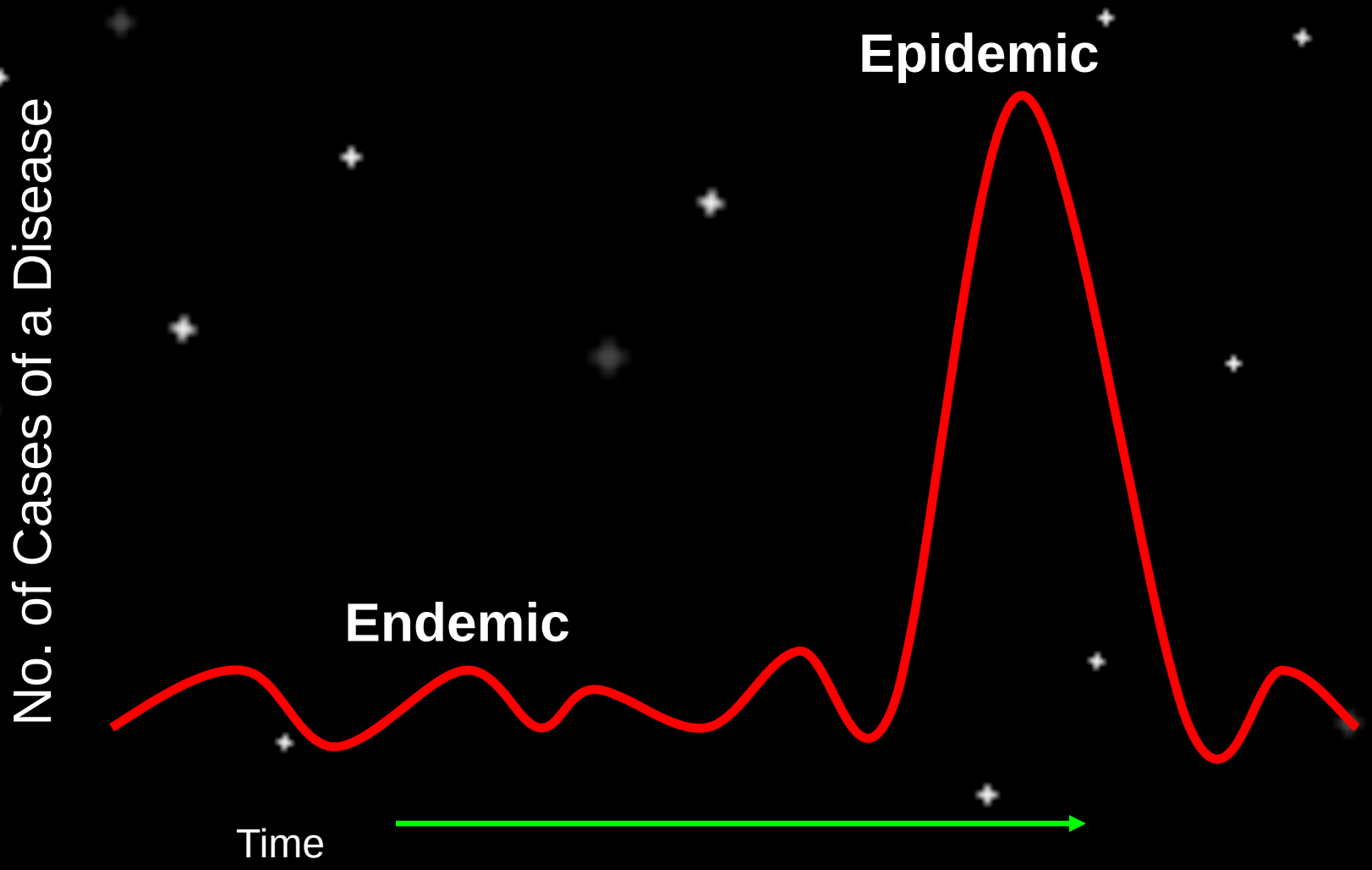


Periodic (Short Term)

- 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.

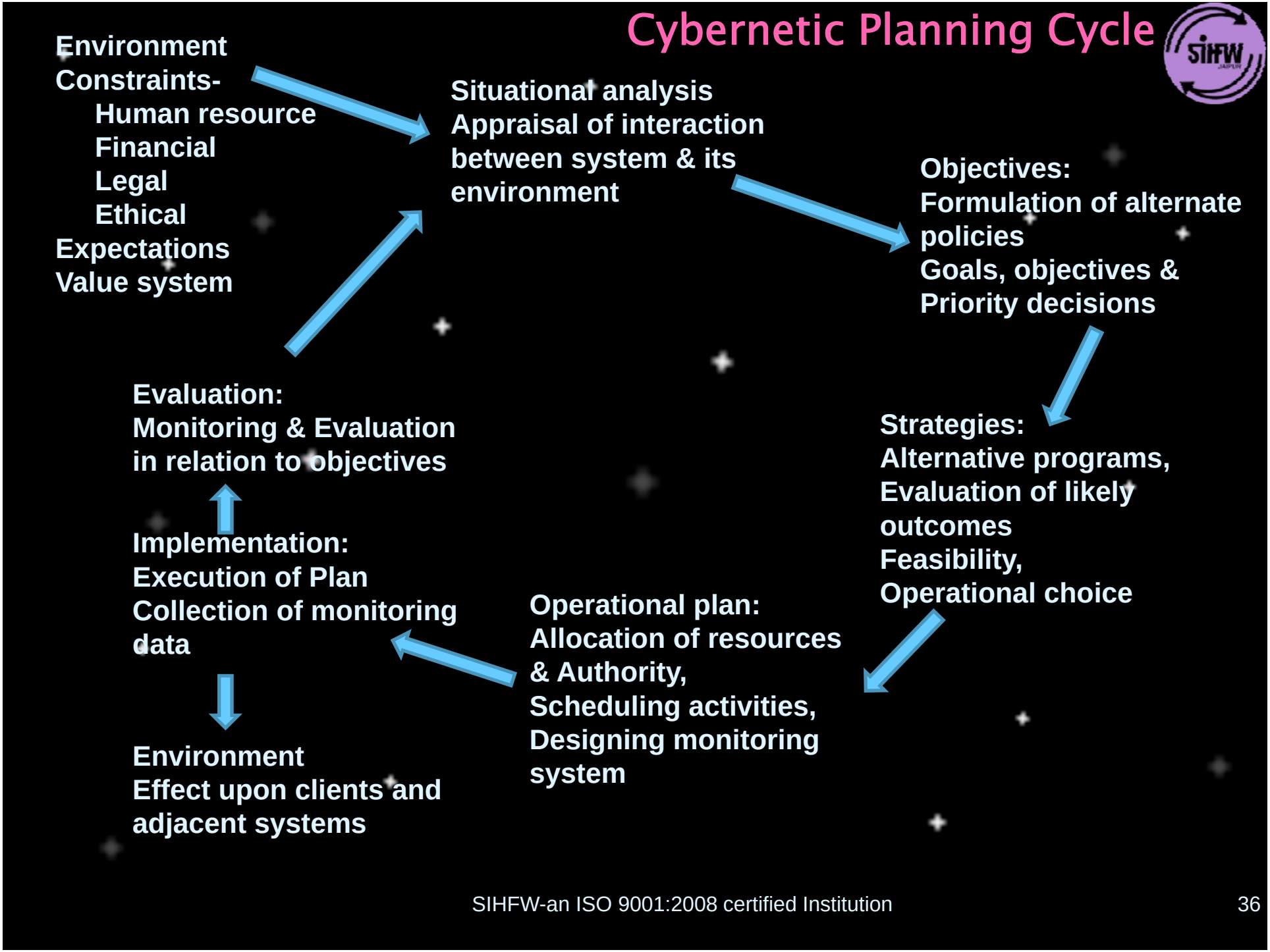
Monitoring

- 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



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

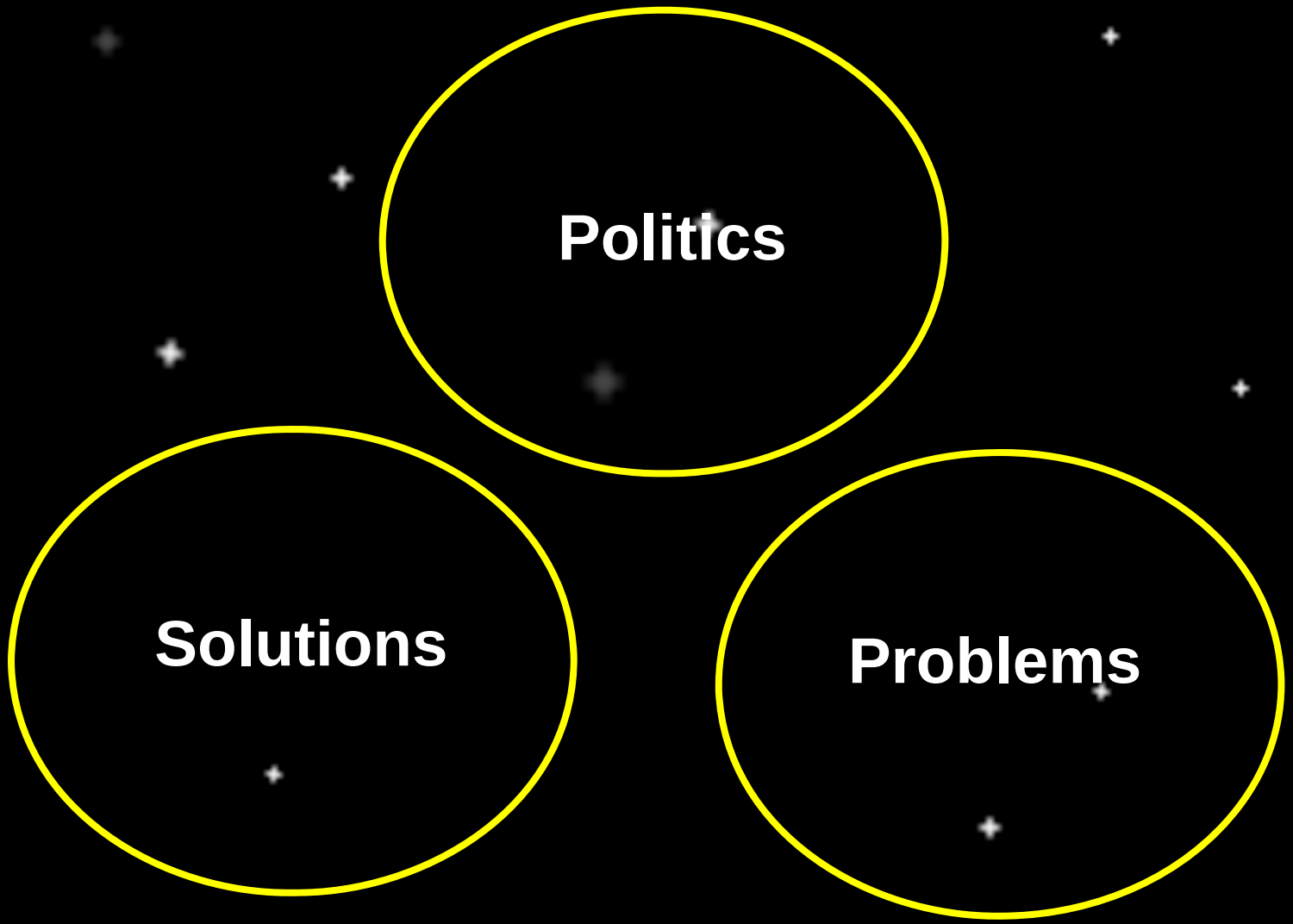
- Uninterested or too busy to read
- Reach hasty conclusions
- Actions unsubstantiated by data
- Distrust survey and research findings
- Limited perspective
- Should be responsible for drawing implications from the data

- 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

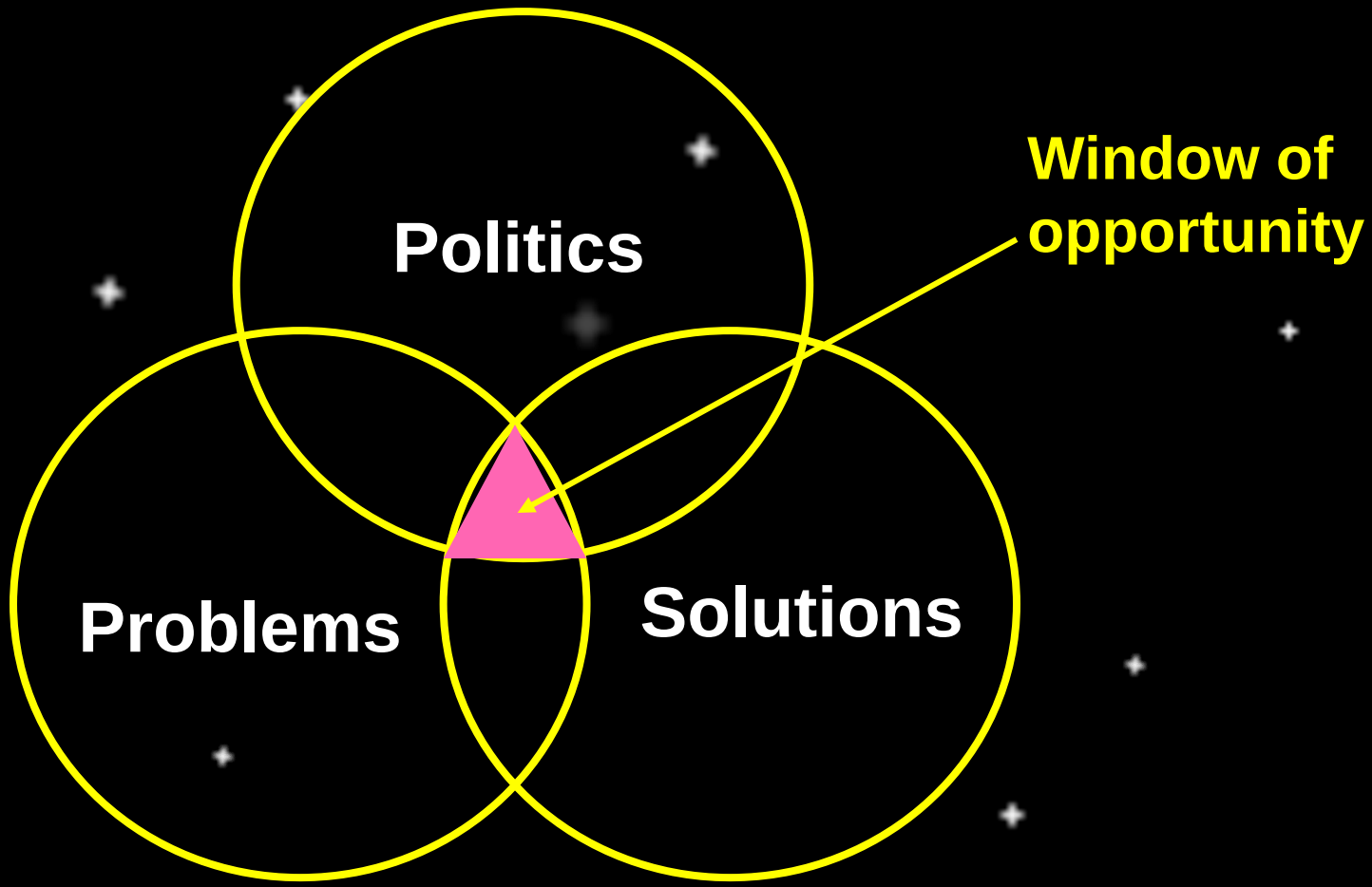
Assumptions About Decision-Making

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

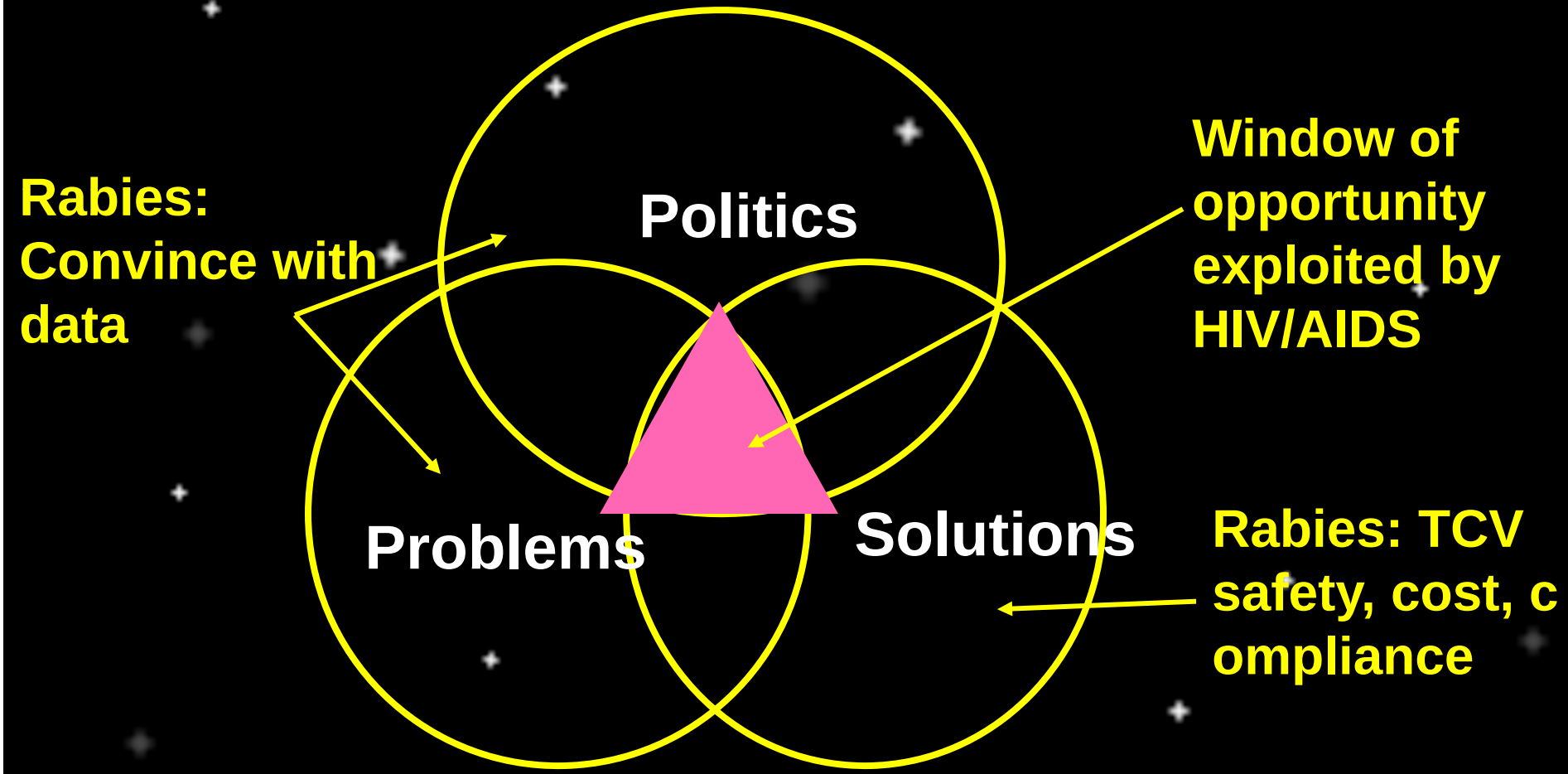
Policymaking is Not Linear



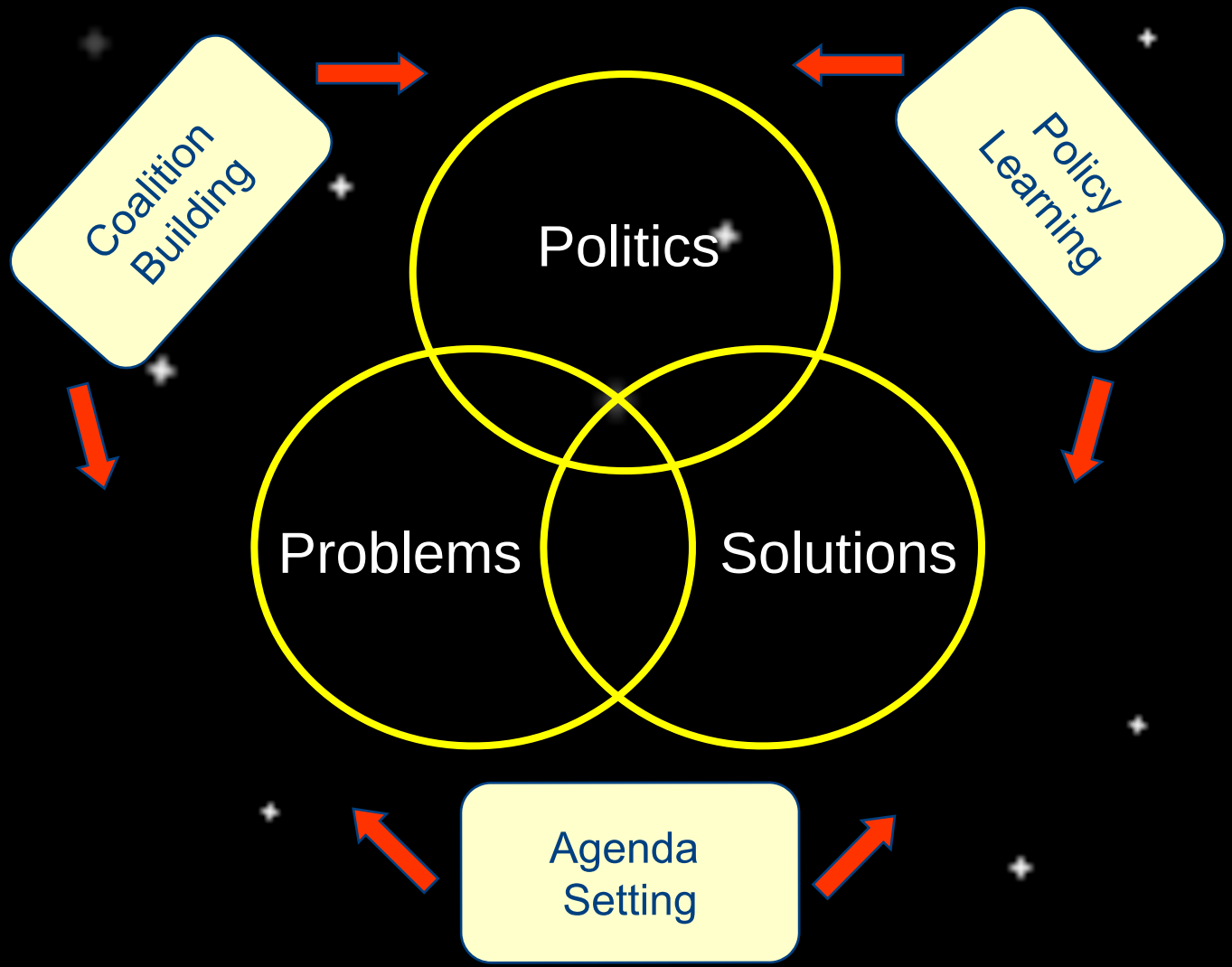
A Window of Opportunity for Policy Change



Using Opportunity



Moving the Spheres Together



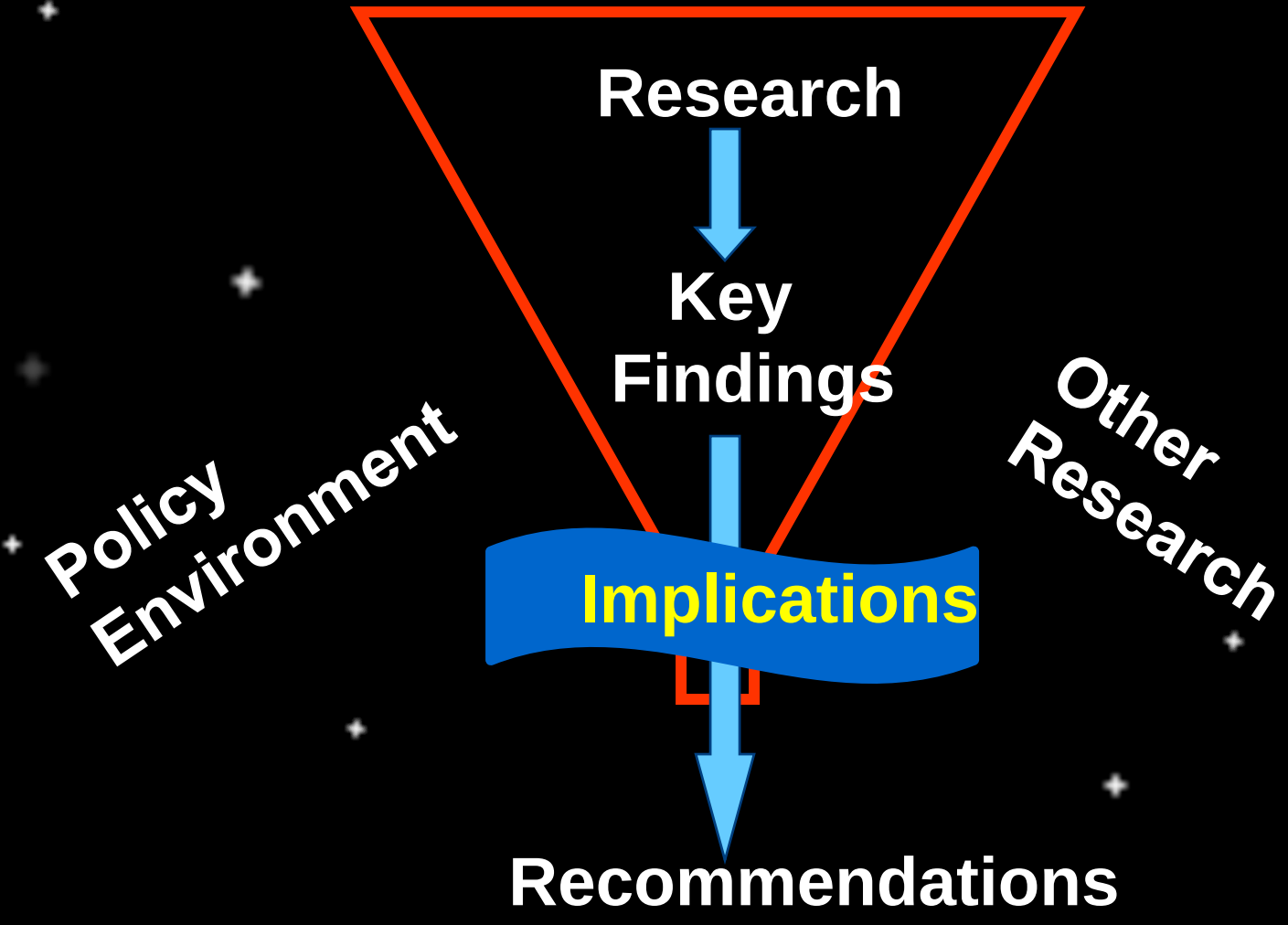
Characteristics of Issues that Get on the Policy Agenda

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

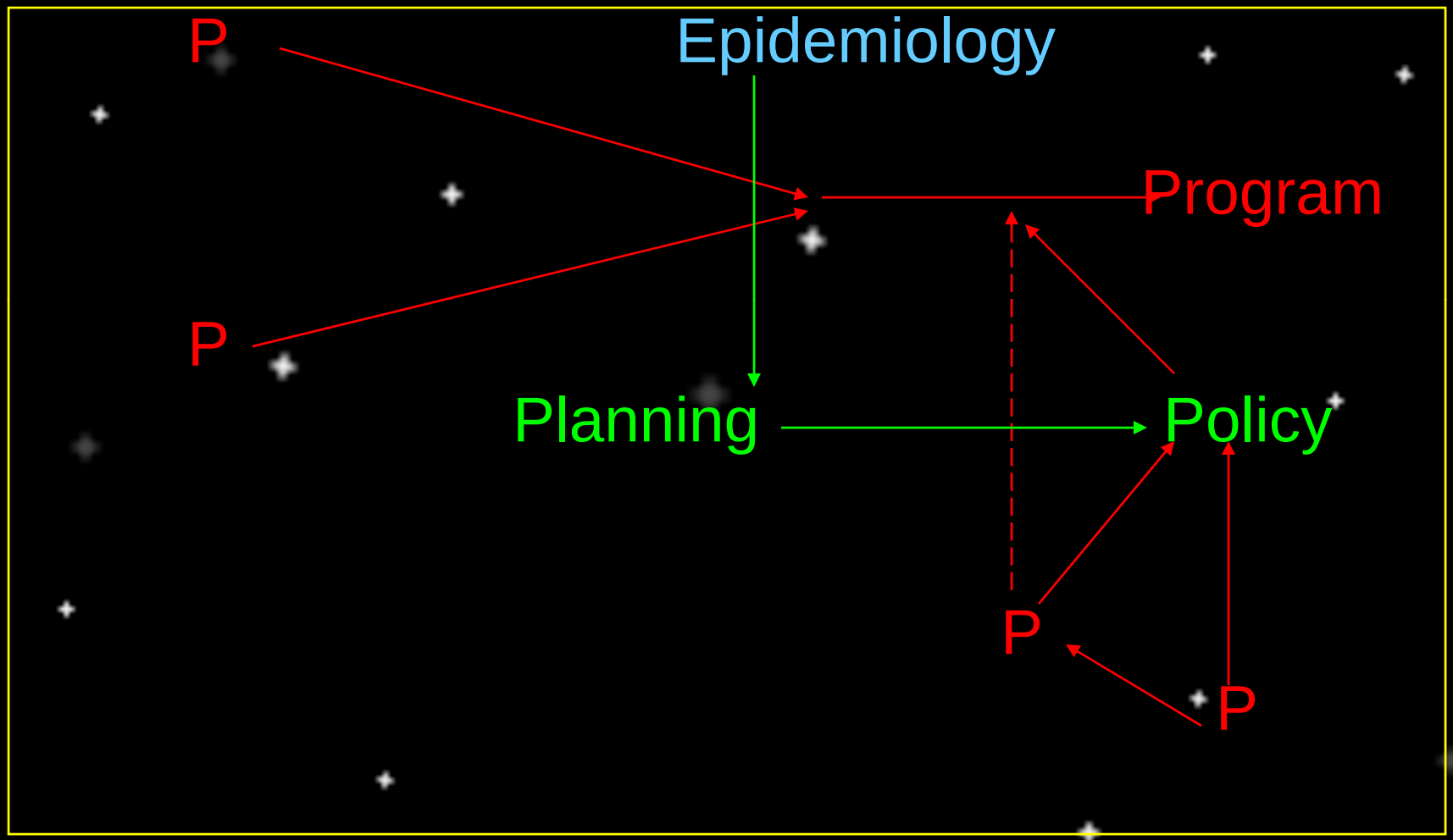
Crafting the Policy Message

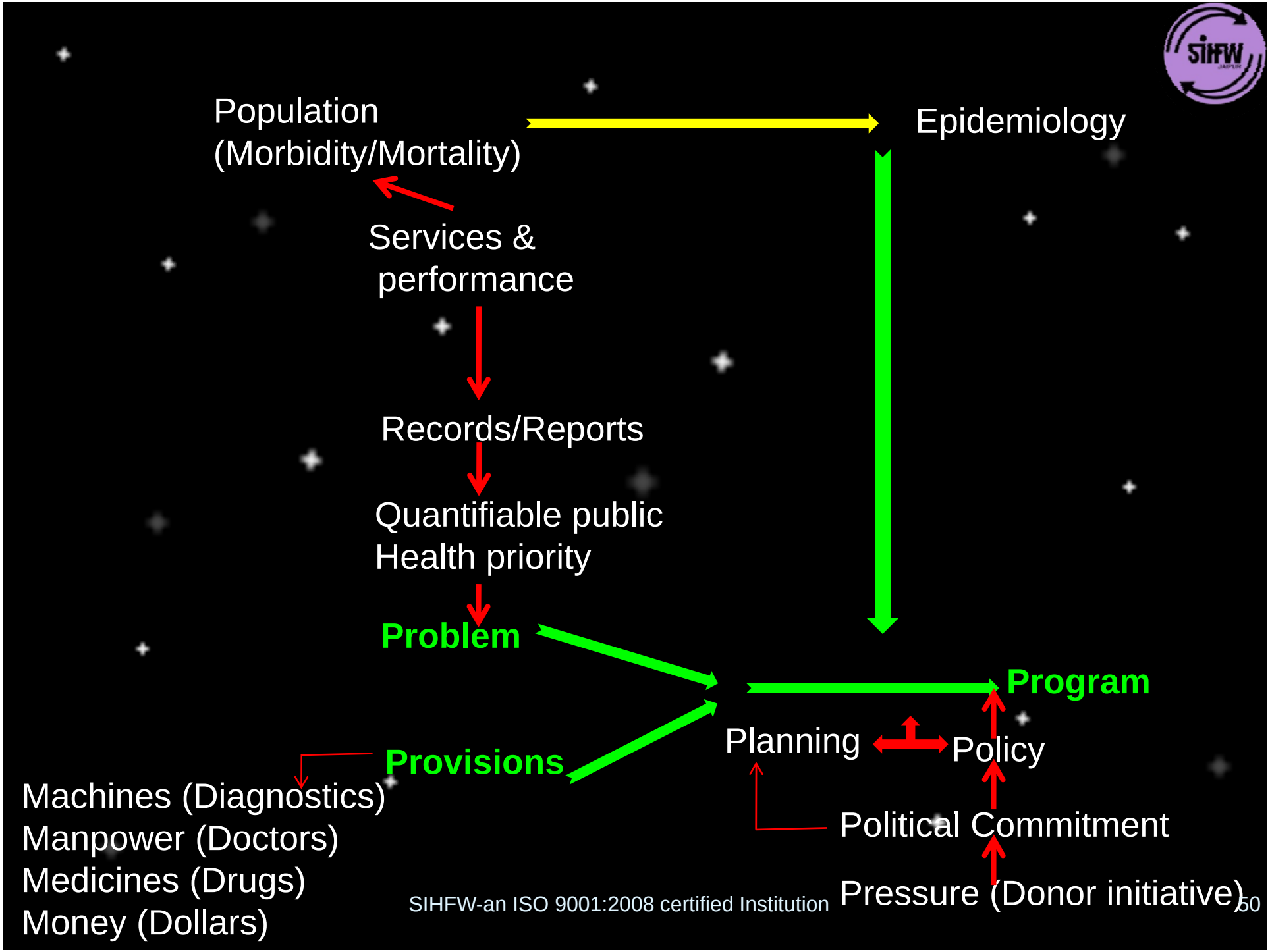
- Policy communication messages
  - derive directly from the data
  - help decision makers to understand policy implications and to make grounded policy recommendations.

Research to Recommendations



Health Programs:




Population
(Morbidity/Mortality)
Epidemiology
Services &
performance
Records/Reports
Quantifiable public
Health priority
Problem
Program
Planning
Policy
Provisions
Machines (Diagnostics)
Manpower (Doctors)
Medicines (Drugs)
Money (Dollars)
Political Commitment
Pressure (Donor initiative)

- 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

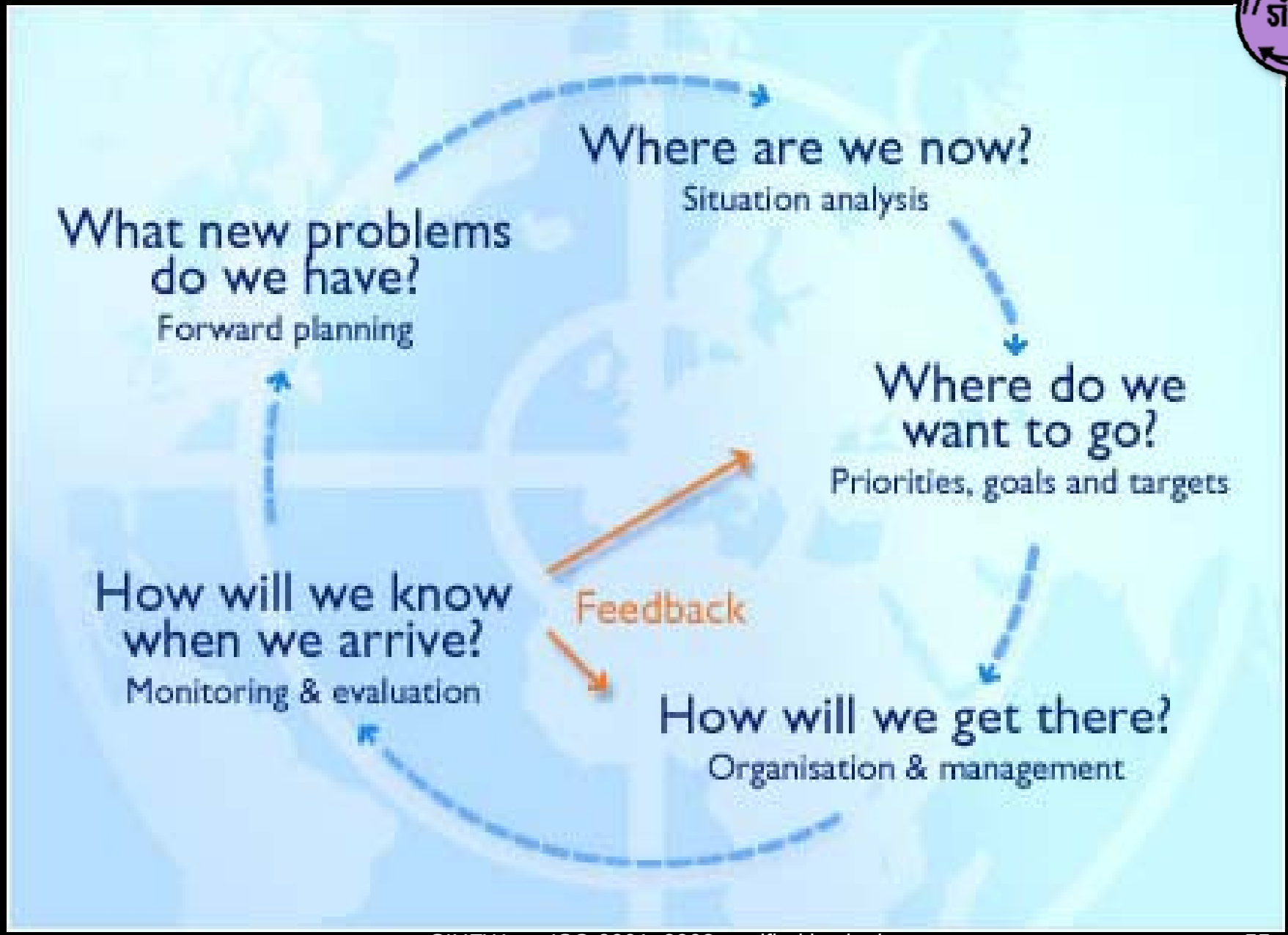
" The orderly process of defining community health problems, identifying unmet needs and surveying the resources to meet them, establishing priority goals that are realistic and feasible and projecting administrative action to accomplish the purpose of the proposed programme."

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**


Where are we now?
Situation analysis
Where do we want to go?
Priorities, goals and targets
How will we get there?
Organisation & management
How will we know when we arrive?
Monitoring & evaluation
What new problems do we have?
Forward planning
Feedback

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

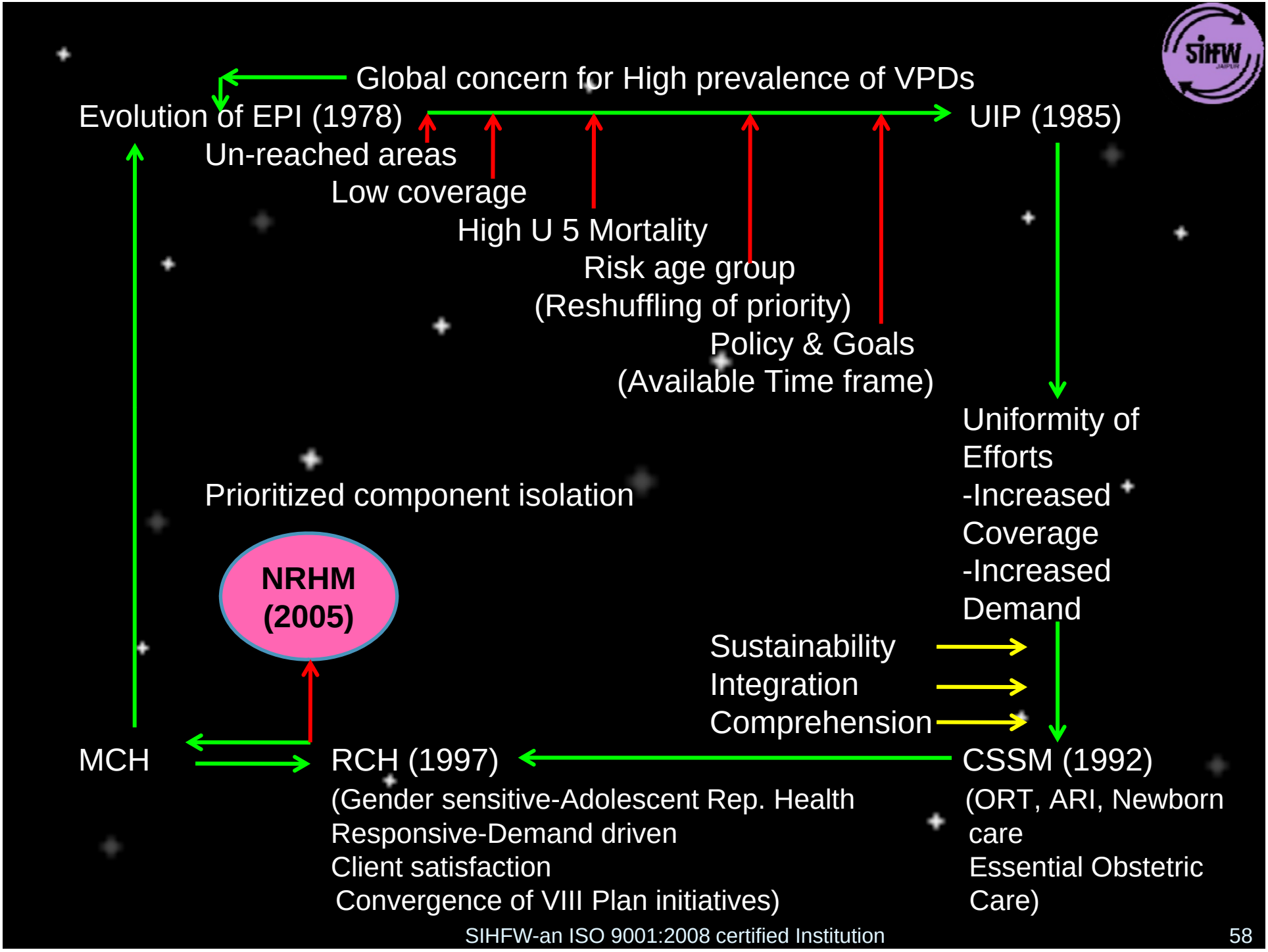
Cases-50000(1961) to 6.4 M (1976)

Malaria Plan of Operation (1977)

Resurgence (1994)

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

(Surveillance
FTD
DDC
UMS
Spray in areas with API > 2)


Global concern for High prevalence of VPDs
Evolution of EPI (1978)
UIP (1985)
Un-reached areas
Low coverage
High U 5 Mortality
Risk age group
(Reshuffling of priority)
Policy & Goals
(Available Time frame)
Uniformity of Efforts
-Increased Coverage
-Increased Demand
Prioritized component isolation
NRHM (2005)
Sustainability
Integration
Comprehension
MCH
RCH (1997)
(Gender sensitive-Adolescent Rep. Health
Responsive-Demand driven
Client satisfaction
Convergence of VIII Plan initiatives)
CSSM (1992)
(ORT, ARI, Newborn care
Essential Obstetric Care)

Milestones

NRHM-2005

NHP-2002

NPP-2000

RCH-1996

UIP-1985

NHP-1983

Alma Ata- 1978

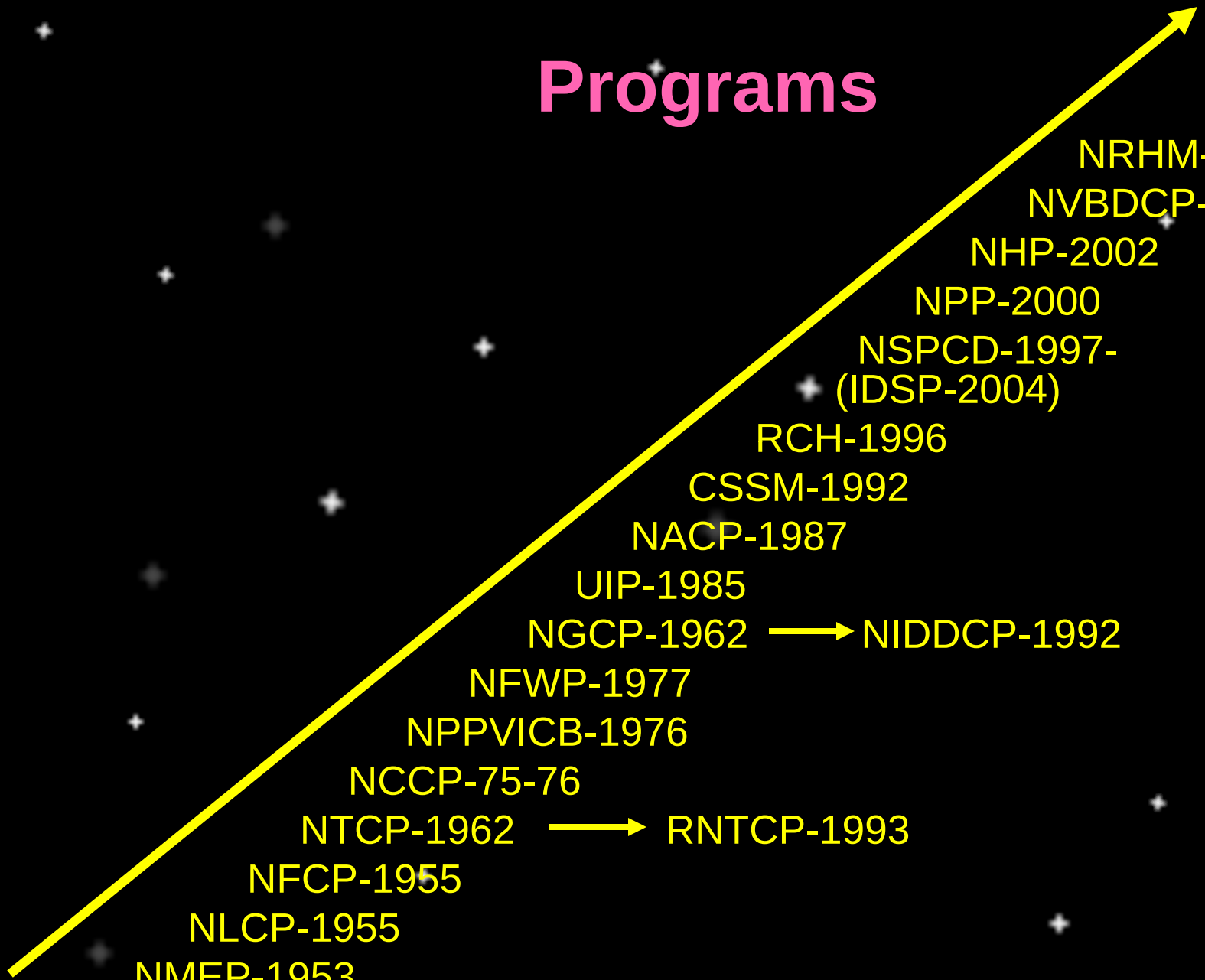
Small pox eradicated- July 5, 1975

NFPP-1952

India Joins WHO-1948

HSDC-1946

Programs


NRHM-2005
NVBDCP-2004
NHP-2002
NPP-2000
NSPCD-1997-
(IDSP-2004)
RCH-1996
CSSM-1992
NACP-1987
UIP-1985
NGCP-1962
NIDDCP-1992
NFWP-1977
NPPVICB-1976
NCCP-75-76
NTCP-1962
RNTCP-1993
NFCP-1955
NLCP-1955
NMEP-1953
NFPP-1952

In the process, we need Data, based on descriptive epidemiology

generated during-

- Service delivery
- Surveys
- Studies

From Where do I 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."

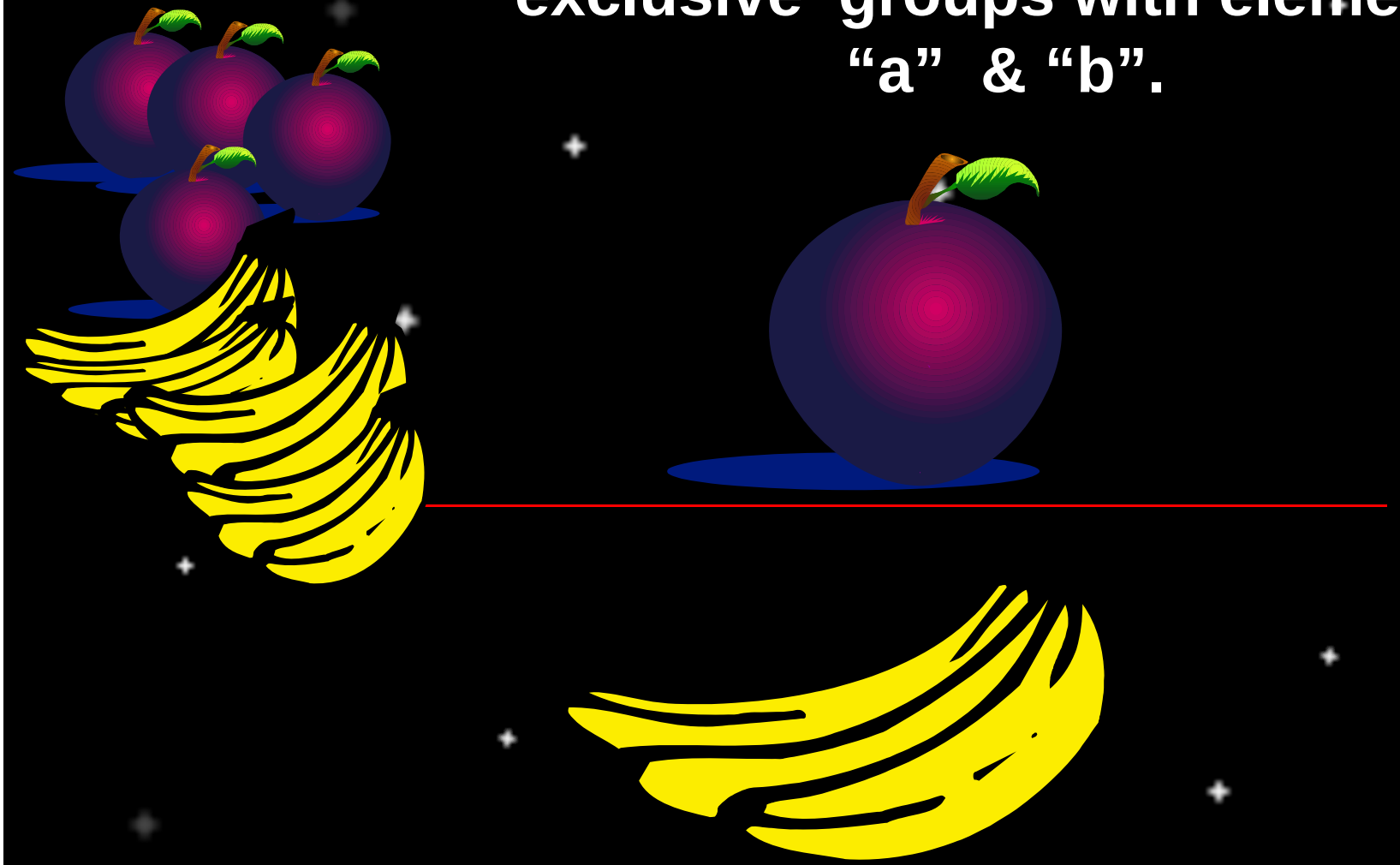
- A numerator
- A denominator that "appropriately" relates the numerator to population at risk
- A "unit" such as per 1000, per 100,000 or per million

Why a Rate?

To ensure comparing apples with apples

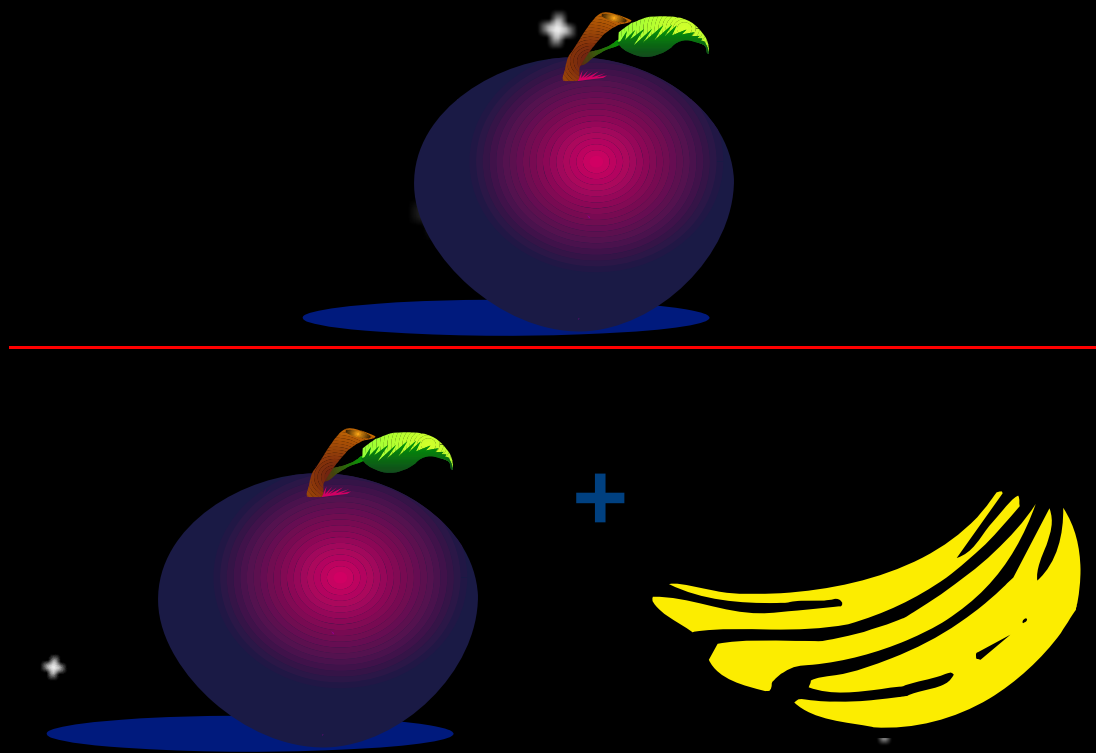
Ratio:

“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 ***given period***	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 -

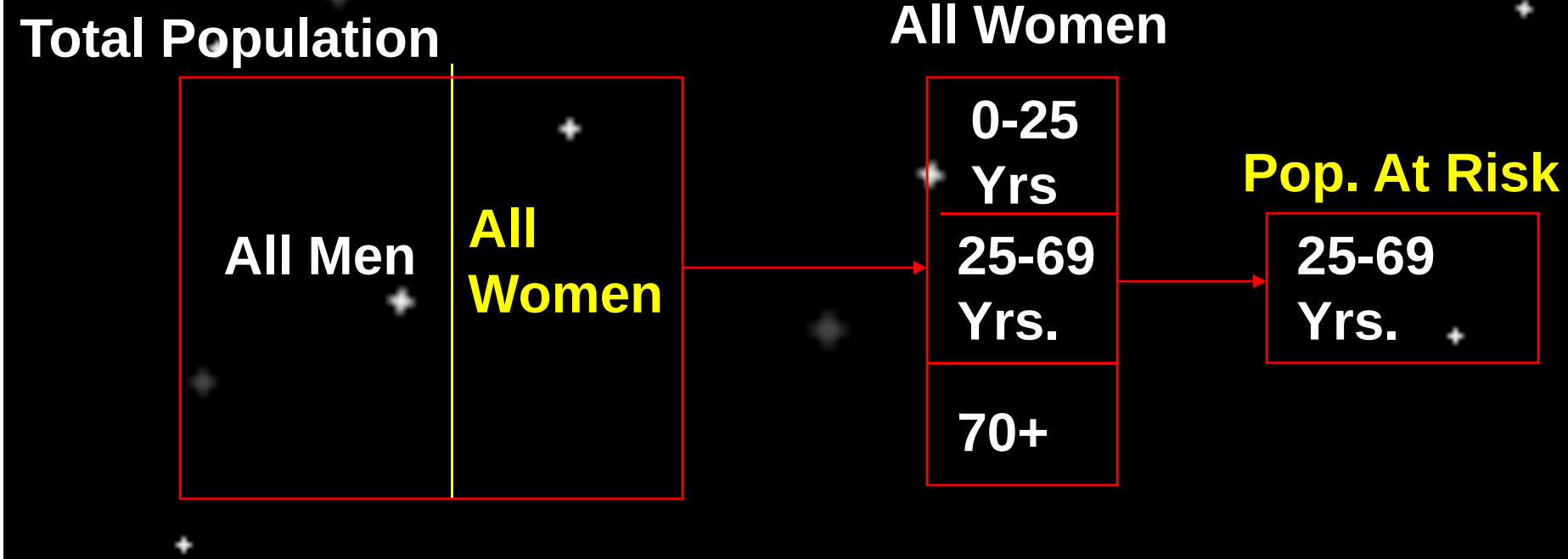
$$\frac{\text{Total no. of cases (new + old)}}{\text{Total population over specified period}} \times 100$$

Point prevalence

Period prevalence

Prevalence rate- a Ratio, reflects status

Population at Risk- in a study of Cancer cervix



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 an 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:

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

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

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

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)=

$$\frac{\text{New cases}}{\text{Population at risk (PAR) during a specified period}} \times 100$$

- Incidence Density (ID)/ Incidence rate=

$$\frac{\textbf{New cases}}{\textbf{Total Person time of observation in PAR, over a specified period}} \times 100$$

"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:

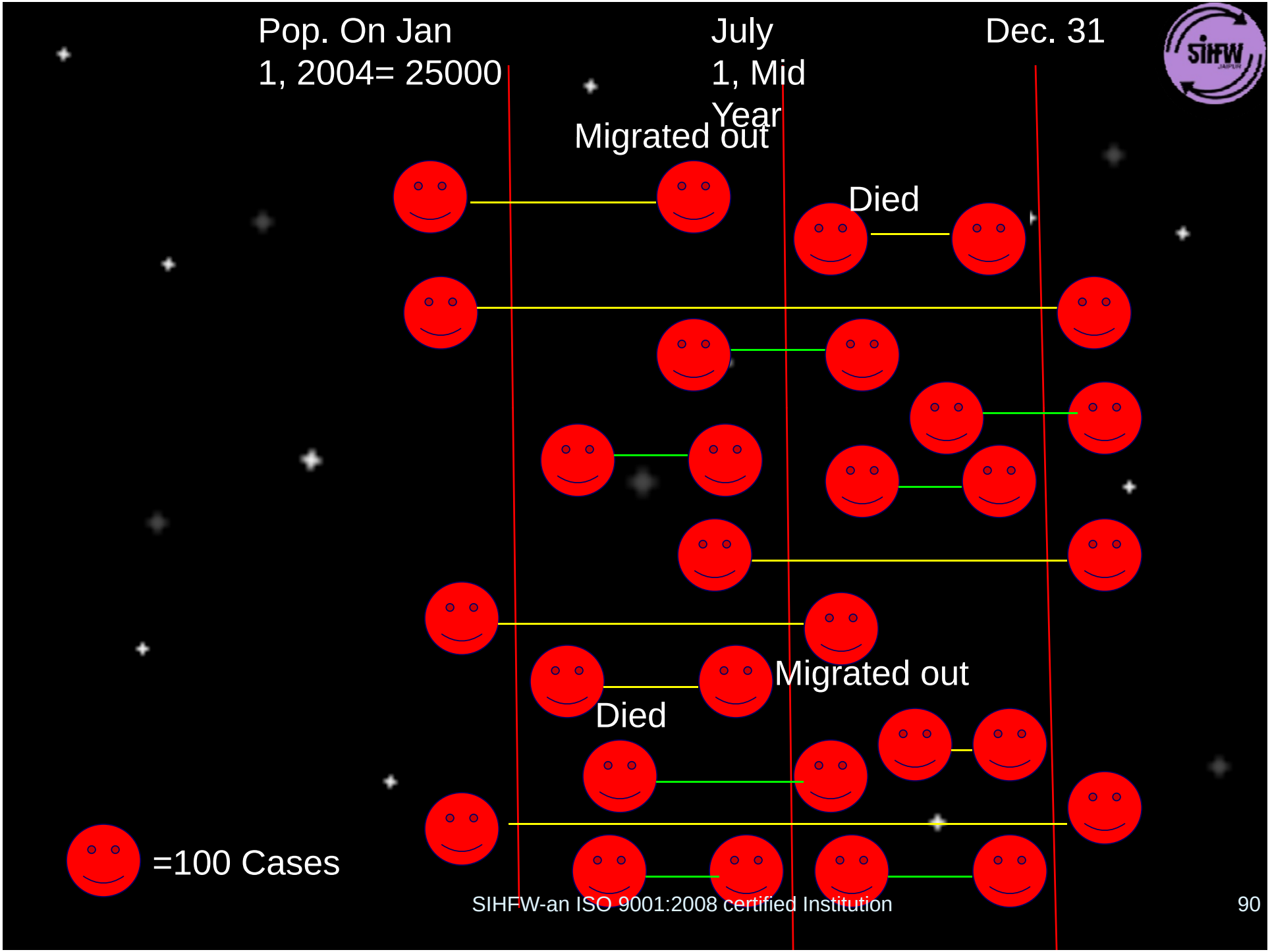
A description of how new cases of disease are occurring. “force of morbidity” “rate of flow” of cases from non disease to disease state

Prevalence (P) and Incidence (I)

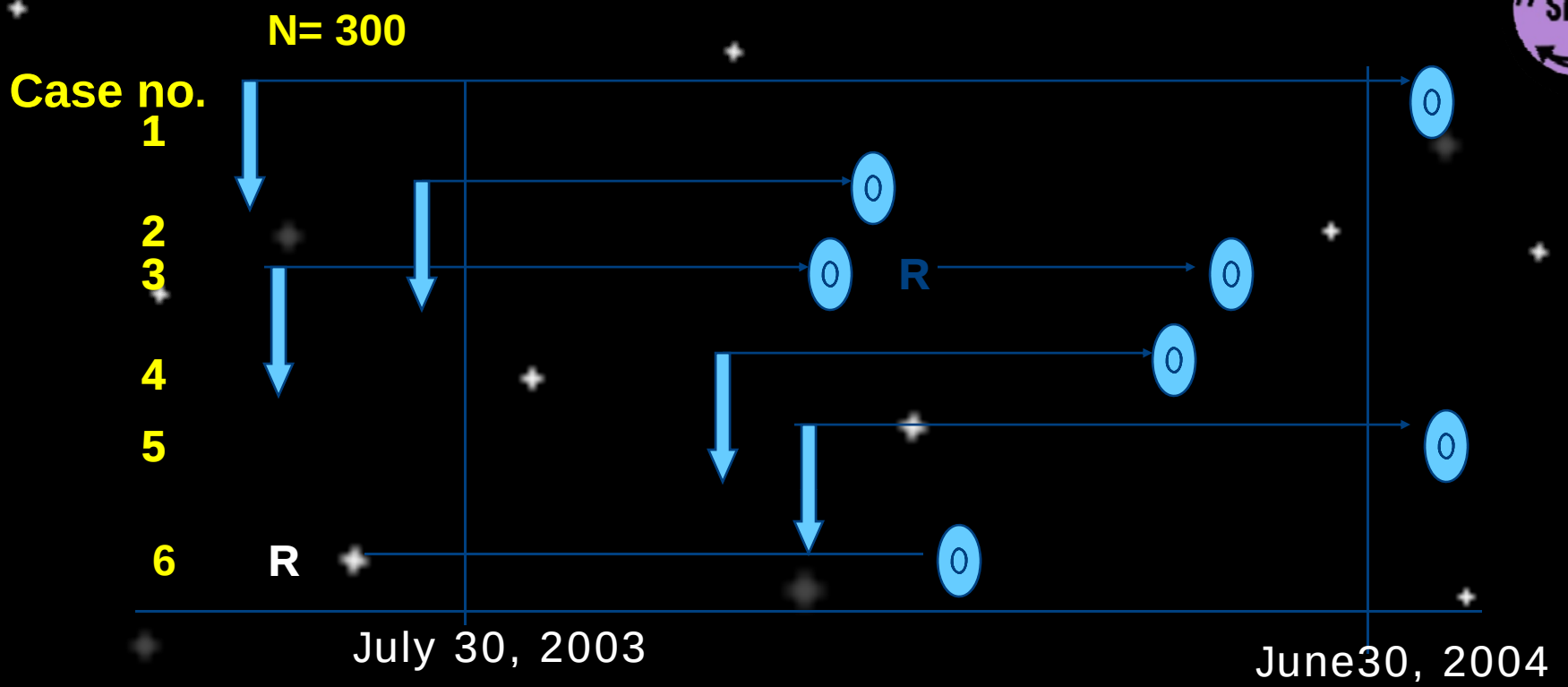
P= I x d

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 x 100 = 1.6 %
- Point prevalence on July, 1, 2004 = 600/ 24800 (i.e. 25000-200) x 100 = 2.41 %
- Point prevalence on December 31, 2004 = 400/ 24600 (i.e25000-400) x 100 = 1.62
- Period prevalence in one year = 400+1100 / 25000-200 x 100 = 6.51%
- Cumulative Incidence for the year (Jan.1, 2004-December 31, 2003) =1100/ 25000-400x 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

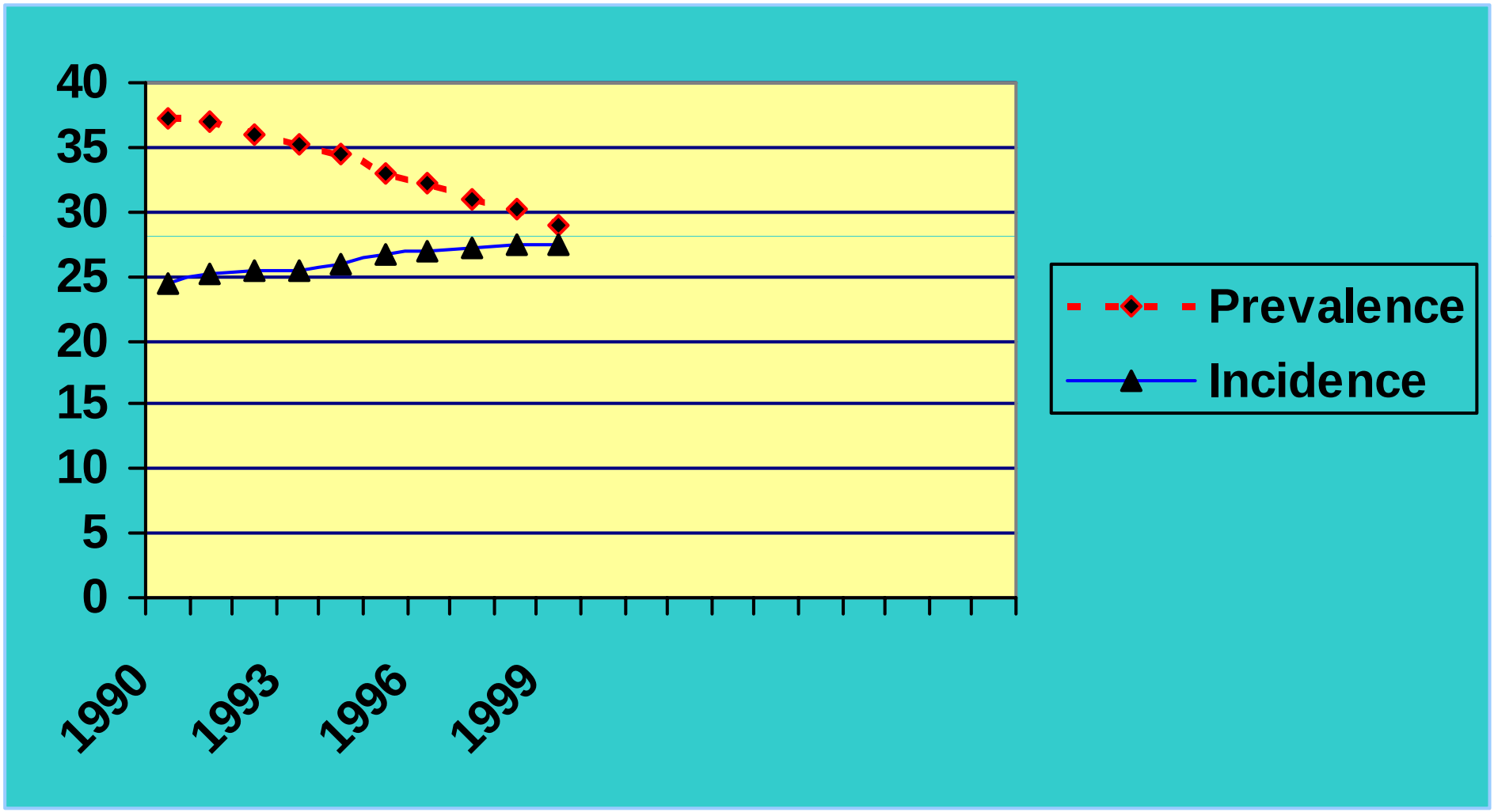
- Prevalence:
  - Relevant for planning of health services
- Incidence:
  - Relevant for exploring causal theories

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

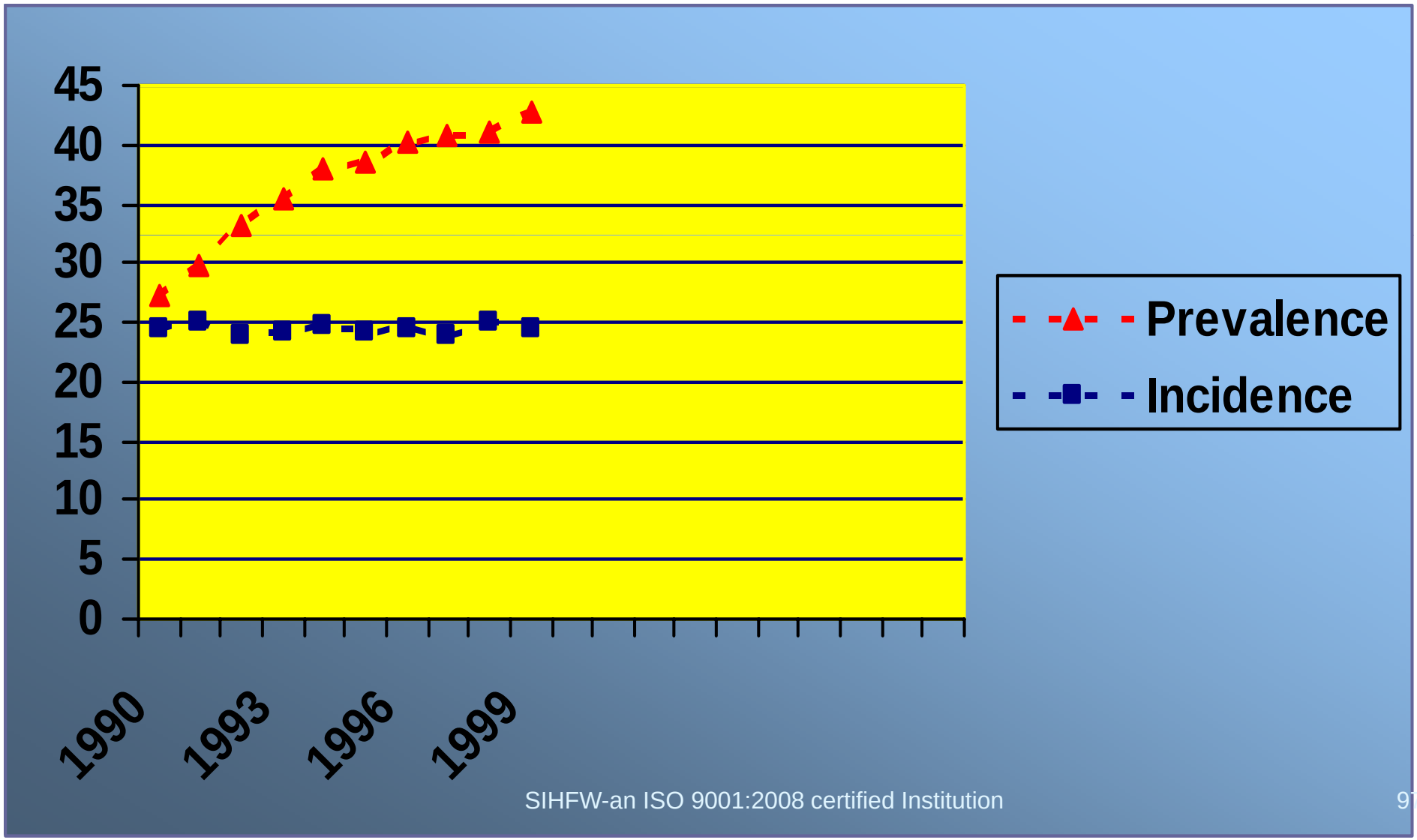
Incidence Increasing but Prevalence Decreasing



Interpretation:

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

Incidence stable but Prevalence increasing Indicates:



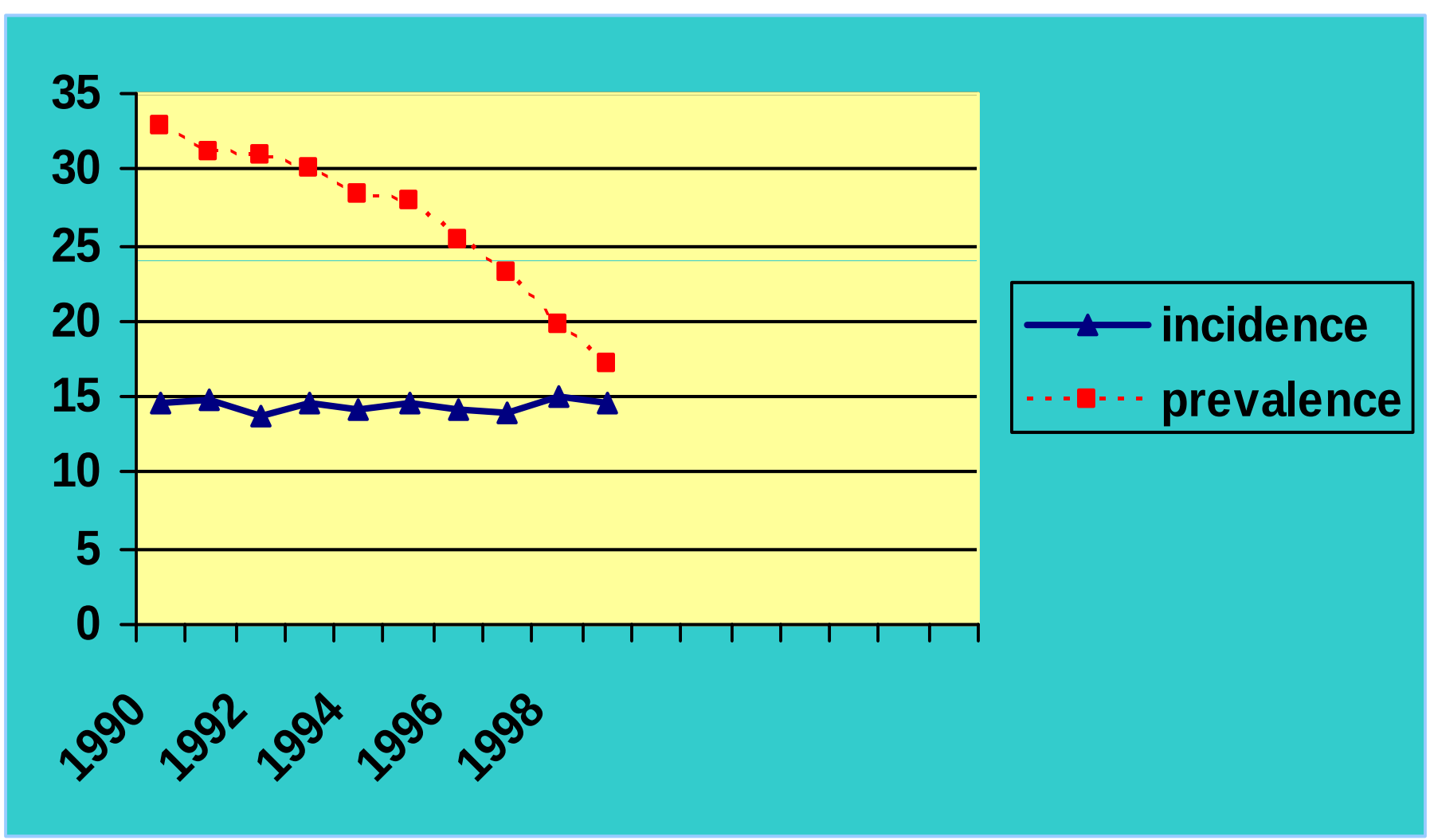
Interpretation

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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