ECC and America Indian/Alaska Native Children

Are we in a Seldon Crisis?
Hari Seldon

- B. 11,988 GE (Helicon)
- D. 12, 069 GE (Trantor)
- Professor (Streeling U)
- Developer: Psychohistory
Combining history, sociology, and statistics to make probabilistic predictions about large groups. [a fictional science]

PSYCHOHISTORY
Seldon Plan

• Understanding [social] science so well that the future can be predicted with precision.
  – Careful analysis of “big data” required

• The plan anticipated certain “crises” [Seldon Crisis]
Seldon Crisis

• A predicted (unwanted) situation created by a convergence of external and internal threats.
• To be successfully surmounted – one possible, inevitable course of action needs to be taken (Resolution).
Seldon Crisis

**External Crisis**

- Few know or acknowledge the seriousness of the situation.
- The result is that there have been little resources aimed at the solution

**Internal Crisis**

- Even among those charged with addressing the issue, there is a tendency to revert to the old, tried and true ways – just do more of the same.
The “Drury” report (1999)

Diagnosing and Reporting Early Childhood Caries for Research Purposes

A Report of a Workshop Sponsored by the National Institute of Dental and Craniofacial Research, the Health Resources and Services Administration, and the Health Care Financing Administration

Thomas F. Drury, PhD; Alice M. Horowitz, PhD; Amid I. Ismail, BDS, MPH, DrPH; Marco P. Maertens, MA; R. Gary Rozier, DDS, MPH; Robert H. Selwitz, DDS, MPH

Dental caries in primary teeth of children 5 years of age or younger is still one of the major health problems in the United States (1). The 1988-94 National Health and Nutrition Examination Survey (NHANES III) found that 84 percent of 2-year-old children had at least one decayed or filled tooth and that by age 5, 40.4 percent of the children were affected. Dental caries in primary teeth is one of the major reasons for hospitalization of children. Evidence from different studies bearing on the relative frequency, etiology, clinical course, and impact of early childhood caries. The commissioned review served as the rationale and basis for convening a group of invited experts at the National Institutes of Health to review current evidence on dental caries in preschool-aged children. This group of experts met on April 28-29, 1999, to review the current evidence on case definitions and the success of research programs to study the epidemiology, etiology, prevention, and treatment of dental caries in preschool-aged children. The review paper (7) and other documents were distributed to the participants prior to the meeting.

During the first half-day of the two-day workshop, presentations were made to set the stage for the workshop. Dr. Slavkin presented NIDCR’s vision for caries research in the 21st century.

Goals:
1. What is pattern of ECC
2. Case definitions (prevalence, severity)
3. Diagnostic criteria
4. Terms to describe patterns
The “Drury” report (1999)

- Caries in the primary dentition (CIPD) remains major health problem in US
  - Prevalence: 8.4% by age 2 and 40% by age 5
- Research hampered by lack of case definitions and diagnostic criteria
- 5 recommendations and a research agenda.
1. There is a lack of critical information on ECC and more research is needed.

Drury
1. Epidemiological
2. Etiological
3. Effective prevention
4. Lesion progression
   1. (non cavitated $\rightarrow$ cavitated)
5. Risk stratification and early identification

QUEST
• Similar needs identified
2. Research on pre-school children should collect data on non-cavitated $(d_1)$ lesion as well as $d_2mfs$

**Drury**
1. Sugar primary etiological agent
2. Modification from saliva, fluoride, trace elements
3. Histology important
4. Non-cavitated lesion described

**QUEST**
- Is diet the causal agent?
- What are modifiers?
- Histology (hypoplasia)
- Should we and can we assess risk ahead of severe disease?
  - Is early lesion detection important?
3. Study results should be age stratified (by year).

Drury
1. Birth – 71 mo. (prior studies went to 89 mo.)
2. Concern over confounding by age (in etiological research)
3. Age important in determining severity

QUEST
• For prognosis and management
  – Age needs to be part of the case definition.
  – Age needs to be part of the risk assessment
4. “ECC” ≥ 1 d1mft; “S-ECC” = atypical, progressive, acute, or rampant patterns of decay.

Drury
1. Some children have atypical or very severe presentation of disease with rapid progression.
   1. < 36 mo. any smooth surface lesion
   2. >36 mo. ?

QUEST
• Age and extent of disease important for definition
• Traditional definitions of S-ECC will not work for AI/AN children?
• Need to consider morbidity and quality of life
5. Prevalence of ECC and S-ECC reporting criteria

Drury
1. By age
2. d₁, d₂, m, f.

QUEST
• Age range needs to be considered
• Severity crucial
Research Agenda

• New diagnostic tools
• Better epidemiology
• Disease patterns
• Prognostic Bio-markers
• Role of social determinants
• Effectiveness of existing interventions
• Health services issues
• Clinical decision making protocols.
• Diagnostic criteria based on clinical relevance
The Plans

Seldon Plan
• Improve the future:
  – Reduce 30,000 years of barbarism to 1,000 years
  – Plan determined by psychohistory modeling (i.e., science)

QUEST Plan
• Improve the future:
  – Reduce childhood suffering and disability as soon as possible
  – Plan through improved interventions that prevent or mitigate CIPD (science)
Are our efforts correctly focused?

WHAT IS QUEST’S OVERARCHING GOAL?
Resolution

• What would success look like?
  – Immediately reduce disease burden
  – Ultimately eliminate CIPD in AI/AN children.

• What needs to be done to achieve that?
  – Use current technology to arrest disease
  – Determine how to prevent the disease.
Diet and Dental Caries: The Pivotal Role of Free Sugars Reemphasized
A. Sheiham and W.P.T. James

The importance of sugars as a cause of caries is underemphasized and not prominent in preventive strategies. This is despite overwhelming evidence of its unique role in causing a worldwide caries epidemic. Why this neglect?

One reason is that researchers mistakenly consider caries to be a multifactorial disease; they also concentrate mainly on mitigating factors, particularly fluoride.

However, this is to misunderstand that the only cause of caries is dietary sugars.
Dietary Sugars ➔ Caries

A necessary (and sufficient) cause
A necessary (and sufficient) cause

Dietary Sugars → Pathogenic Biofilm → Tooth Decay

Mean Sugar Consumption

Sugar
Dietary Sugars

A necessary and sufficient cause

Pathogenic Biofilm

Tooth

Decay

Mean Sugar Consumption

Sugar
Dietary Sugars

A necessary and sufficient cause

Pathogenic
Tooth
Biofilm

Decay

Mean Sugar Consumption

Sugar

WHO goal: 5%
Dietary Sugars

Child Behavior (Parent)

SES

MEDIATED FACTORS

Food Policy

Culture

Geography

Genetics

Dietary Sugars

decay

Decay

Sugar
Internal Crisis: Our current tools are not up to the job

Measurement tools (Drury et al were right)
NHANES Caries (dmft) 3 year olds

Distributions matter

Phipps et al (2012)
- Decay 3 times higher in AI preschool children
The Problem

Severe Caries

Extensive (OR/GA) Treatment

US Pop

AI/AN Pop
Distributions Matter:

• If most of the pop. is “outlier” - rules break down.
• Morbidity and quality of life issues become important
• Treatment needs complex
Internal Crisis: Our current tools are not up to the job

• Approach to prevention and treatment inadequate
  — (Don’t bring a knife to a gunfight)
• More of the same is not going to get the job done.
  — (We ‘re going to need a bigger boat)
Prevention Strategies (Individual)

- Oral Hygiene Behavior
- Utilization of dental services
- Diet Behavior
Prevention Strategies (Provider)

- Health Promotion
- OHI
- Sealants
- Fluorides
- OTHER
  - SN
  - SDF
  - “TBD”
External Crisis: Few know or acknowledge the seriousness of the situation.

• Is this accepted by those who can do something
  – Funders
  – Policy makers
  – Researchers
  – Clinicians
  – Parents
External Crisis: Have sufficient resources been aimed at finding a solution

• Are we asking the “right” questions?
  – How should we be exploring clinical technologies?
  – Should we be working upstream?
  – What are the upstream targets?
There are several right places

- **Curative:**
  - Better clinical therapies
  - Do we have the silver bullet?

- **Preventive:**
  - Better upstream approaches
### Intervention Effectiveness (tooth)

<table>
<thead>
<tr>
<th>Evidence for Effectiveness</th>
<th>No Evidence for Effectiveness</th>
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<tbody>
<tr>
<td>Sealants +++</td>
<td>CHX</td>
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<tr>
<td>Fluoride ++</td>
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<tr>
<td>SDF +</td>
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<tr>
<td>Povidone Iodine +</td>
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<tr>
<td>Xylitol +</td>
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<td>OH+</td>
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</table>
Intervention Effectiveness (individual)

Evidence for Effectiveness
- Interrupt transmission +
- Xylitol +
- Diet +

No Evidence for Effectiveness
- Probiotics
- Flossing
Intervention Effectiveness (provider)

Evidence for Effectiveness
- Dental Health Education +
- MI +
- (clinical therapies)

No Evidence for Effectiveness
- Generic OH or diet counseling
## Intervention Effectiveness (macro)

<table>
<thead>
<tr>
<th>Evidence for Effectiveness</th>
<th>No Evidence for Effectiveness</th>
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<tbody>
<tr>
<td>• Policy changes</td>
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<tr>
<td>– Pouring rights</td>
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<td>– Excise taxes</td>
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<td>• CWF</td>
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<td>• School-based health promotion</td>
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Current state of intervention research

• At the level of tooth, individual and provider
  – Poor quality studies common (C, D)
    • Few RCTs
    • Most at high risk of bias
    • Most poor assessment of penetrance of fidelity
  – Studies not relevant to AI populations.
Current state of etiology research

- All roads lead through diet (sugar)
ARE THERE LESSONS TO BE LEARNED?
Lessons RE: Clinical approaches
– ok, but...

- Least cost-effective (but highly effective)
- Benefits accrue to selected individuals
  - Increase disparities possible
- Cost of implementation high
- Sustainability depends on sustainable funding
- Ethical imperative
Lessons RE: Upstream approaches

- Most cost-effective
- Benefits accrue to entire population
- Implementation Costs (can be) low
- More sustainable
  - Alter culture
Lessons RE: Upstream approaches

- They can empower people and give them a role in managing their own health
  - Not paternalistic
  - Do not create dependencies
  - Reduce disparities
We have examples of programs that work

- This is an area of active and productive research
- Smoking
- Obesity
- Chi – systematic review
The “best” approach...

- Multi-level
- Locally adapted
- but...scalable
- In for the long term (culture change)

- Population health improving
- Cost-effective
- Sustainable
- Acceptable