

Periodontal Disease and Chronic Diseases: Emerging Science and Programs

Periodontal Disease and Diabetes

National Oral Health Conference

St. Louis

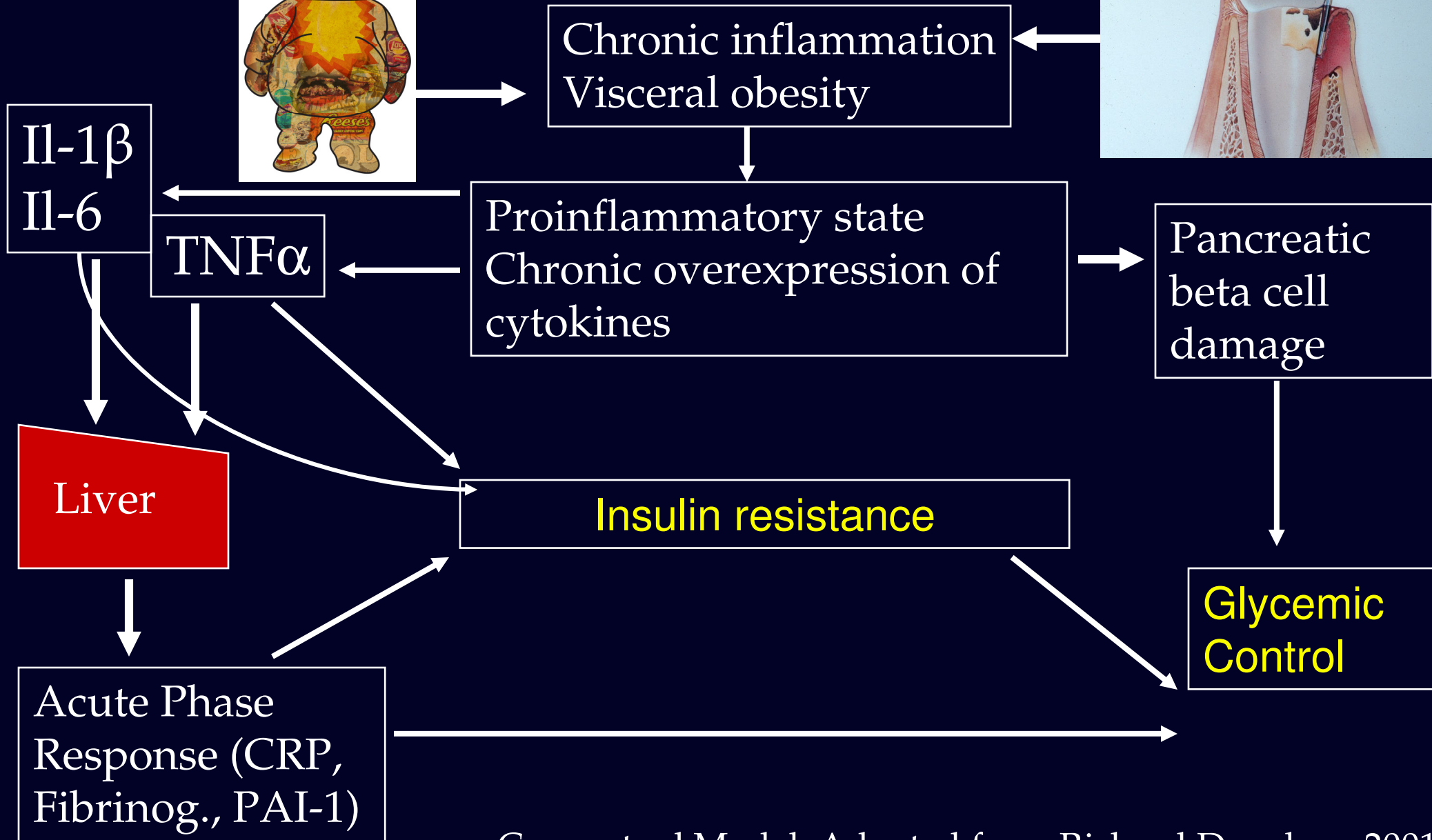
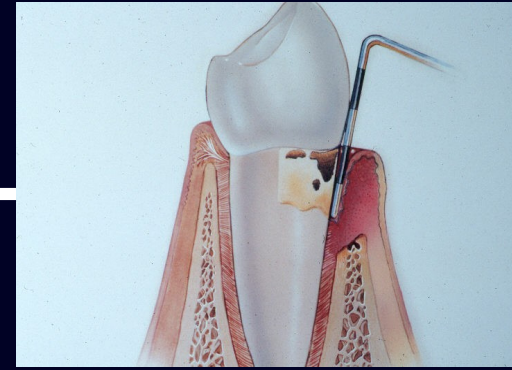
April 27, 2010



George W. Taylor, DMD, DrPH

Overview

- ◆ Conceptual model for relationships involving periodontal infection, systemic inflammatory burden and diabetes
- ◆ Supporting empirical evidence, periodontal infection and/or its treatment and ...
 - ◆ chronic systemic inflammatory burden
 - ◆ glycemic control
 - ◆ complications of diabetes
 - ◆ incidence of diabetes
 - ◆ medical care costs
- ◆ Conclusions



Conceptual Model: Adapted from Richard Donahue, 2001

Supporting empirical evidence

- ◆ Periodontitis and systemic inflammatory burden

Periodontal therapy: effects on systemic inflammation

◆ Improved endothelial function

- ◆ Seinhof et al., 2005
- ◆ Elter et al., 2006
- ◆ Tonetti et al., 2007

◆ CRP level reduced

- ◆ Offenbacher et al., 2009
- ◆ Seinhof et al., 2005
- ◆ D'Aiuto et al., 2005
- ◆ Ebersole et al., 1997

◆ IL-6 levels reduced

- ◆ D'Aiuto et al., 2005
- ◆ Iwamoto et al., 2003

◆ TNF α levels reduced

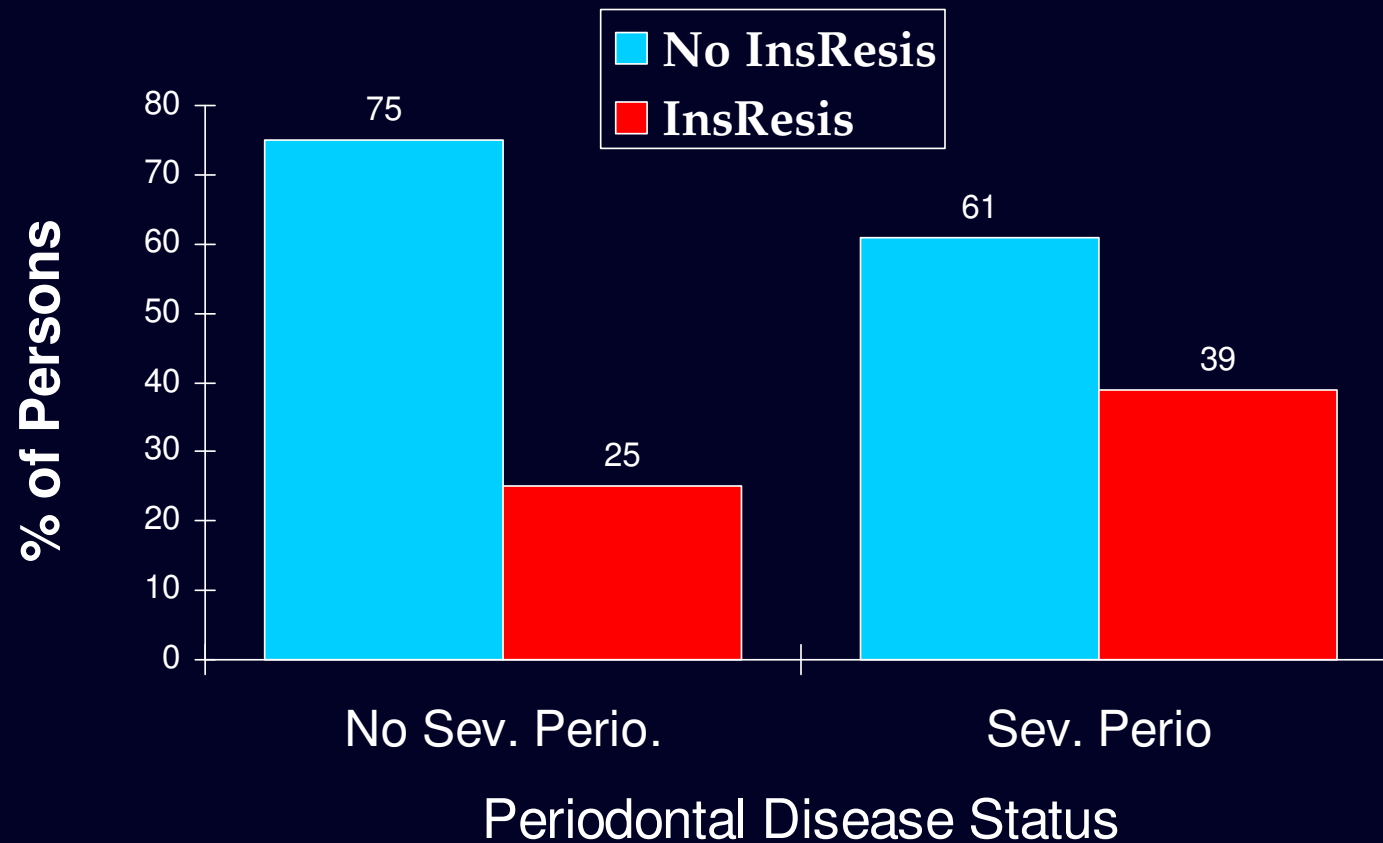
- ◆ Iwamoto et al., 2003

Supporting empirical evidence

◆ Periodontitis and insulin resistance

Prevalence of insulin resistance (HOMA 80th) in U.S. adults, ages 18+, by periodontal status*

Unadjusted odds ratio=2.3 (95%CI: 1.6, 3.4)



* Sev. Perio=1+ site w LPA 6 mm+, gingival bleeding

Source: NHANES III (1989-94), US Population

Logistic regression model

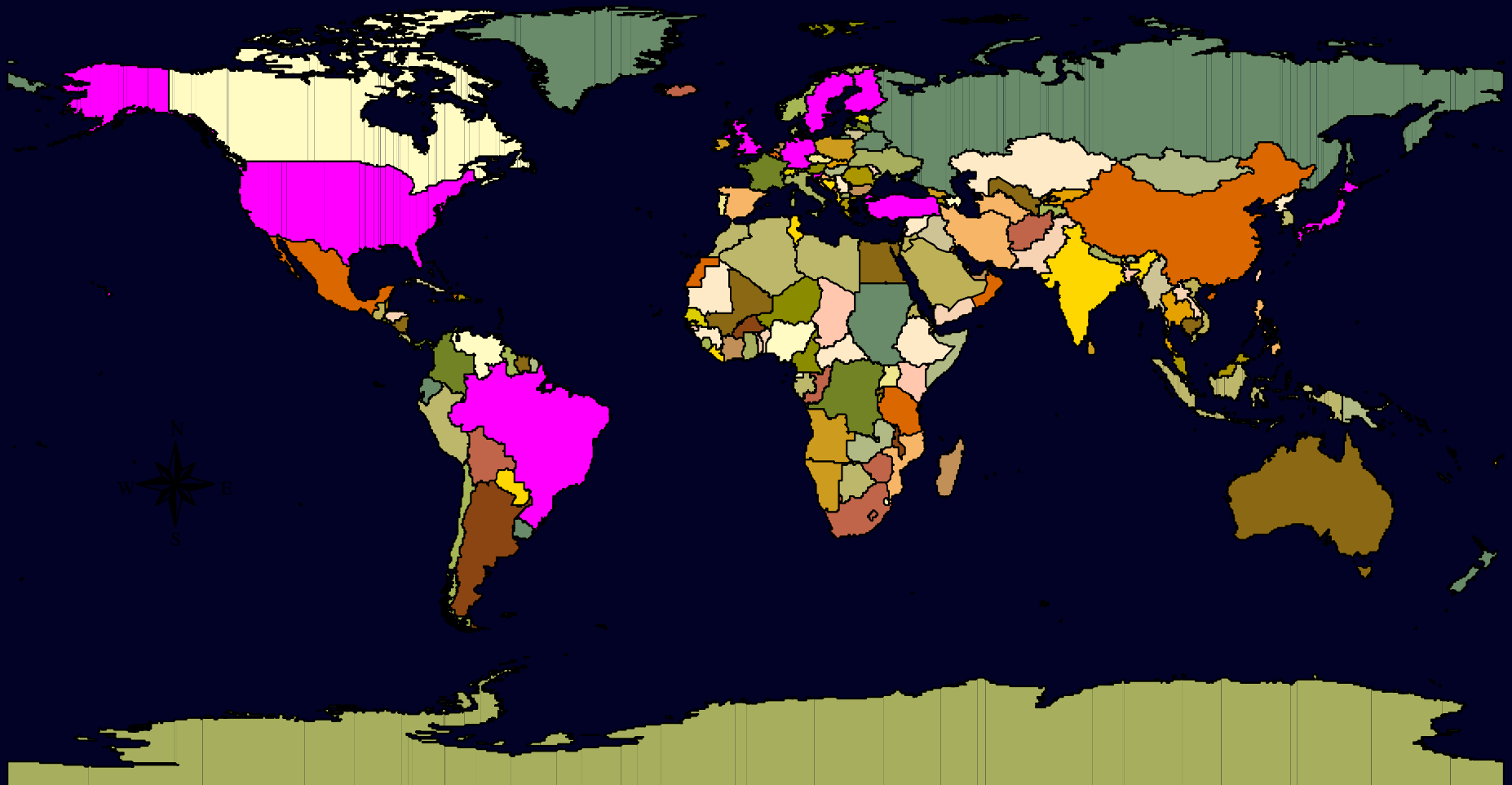
Response: HOMA 80th (n=1574/5313)

COVARIATE	OR	95% CI
Severe perio.	1.74	1.01, 3.0
BMI (>27)	4.77	4.1, 5.6
HDL (≤40)	2.2	1.7, 2.9
TRIG (>200)	2.7	2.0, 3.6
CRP	1.3	1.1, 1.5
Diabetes	4.72	2.6, 8.4

Other covariates controlled in model were age, race/ethnicity, exercise, white blood cell count, fibrinogen.

Periodontal Infection and Glycemic Control: Intervention Studies

Locations of clinical therapeutic studies



Non-surgical periodontal therapy studies: Organizing the evidence (as of 2009)

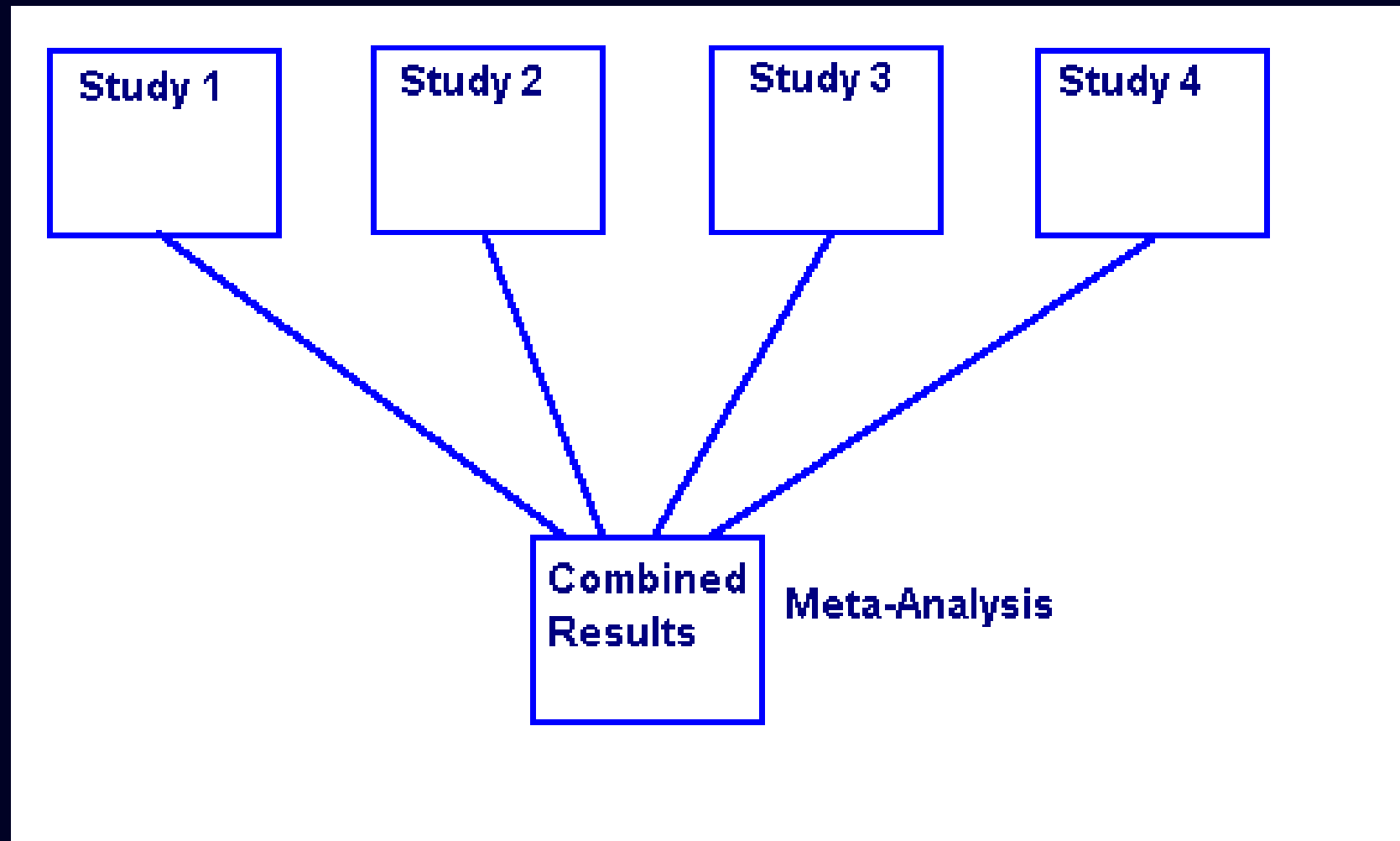
◆ Randomized clinical trials (RCT)

- ◆ Non-treated control group: 1 positive/3 studies
- ◆ Positive control group: 5 positive/6 studies
- ◆ Usual source of care: 0 positive/1 study

◆ Non-randomized clinical treatment studies (non-RCT)

- ◆ Non-treated control group: 1 positive/2 studies
- ◆ No control group: 11 positive/19 studies

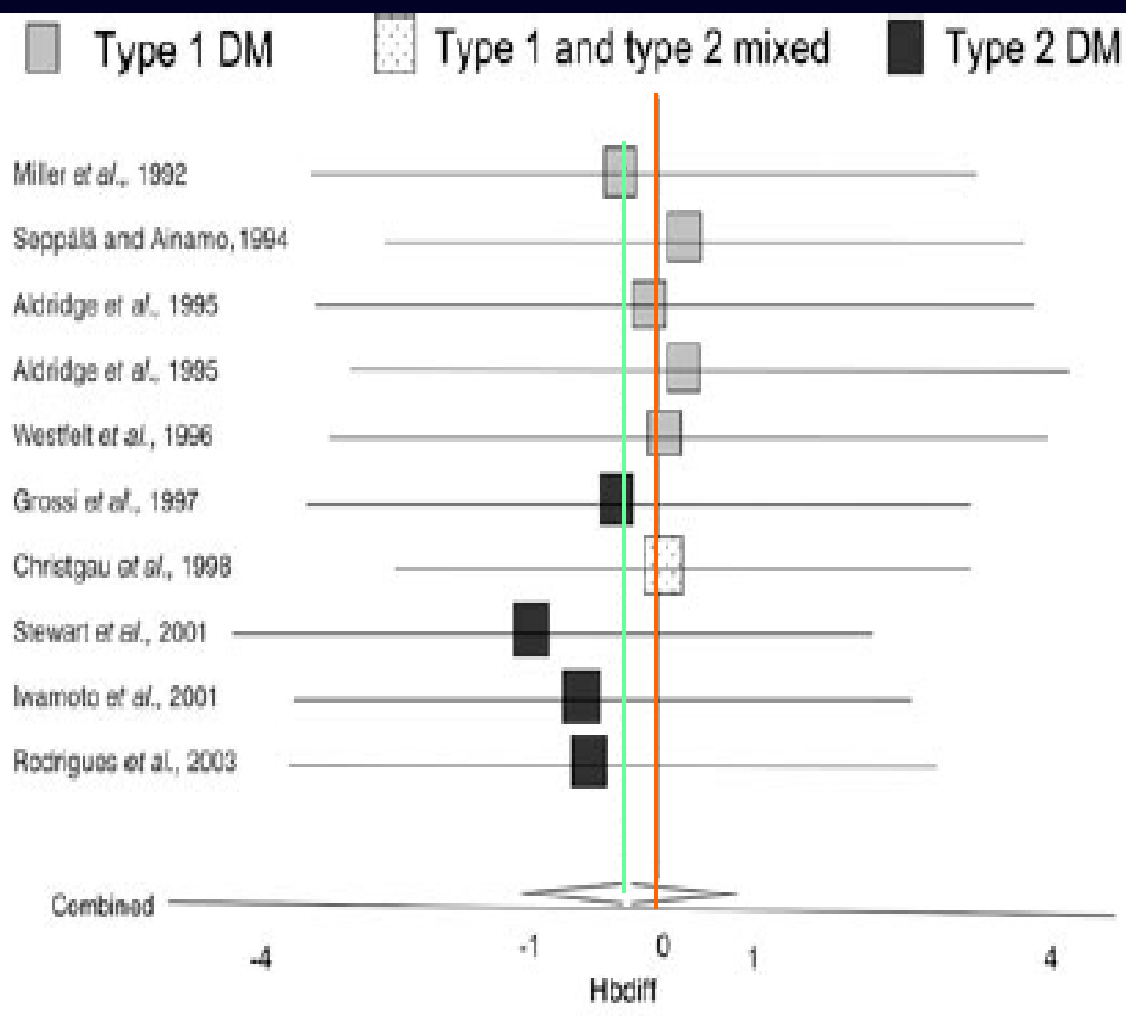
Systematic Review and Meta-analysis



Source: SUNY- <http://library.downstate.edu/EBM2/2700.htm>

Non-surgical periodontal therapy: a meta-analysis.

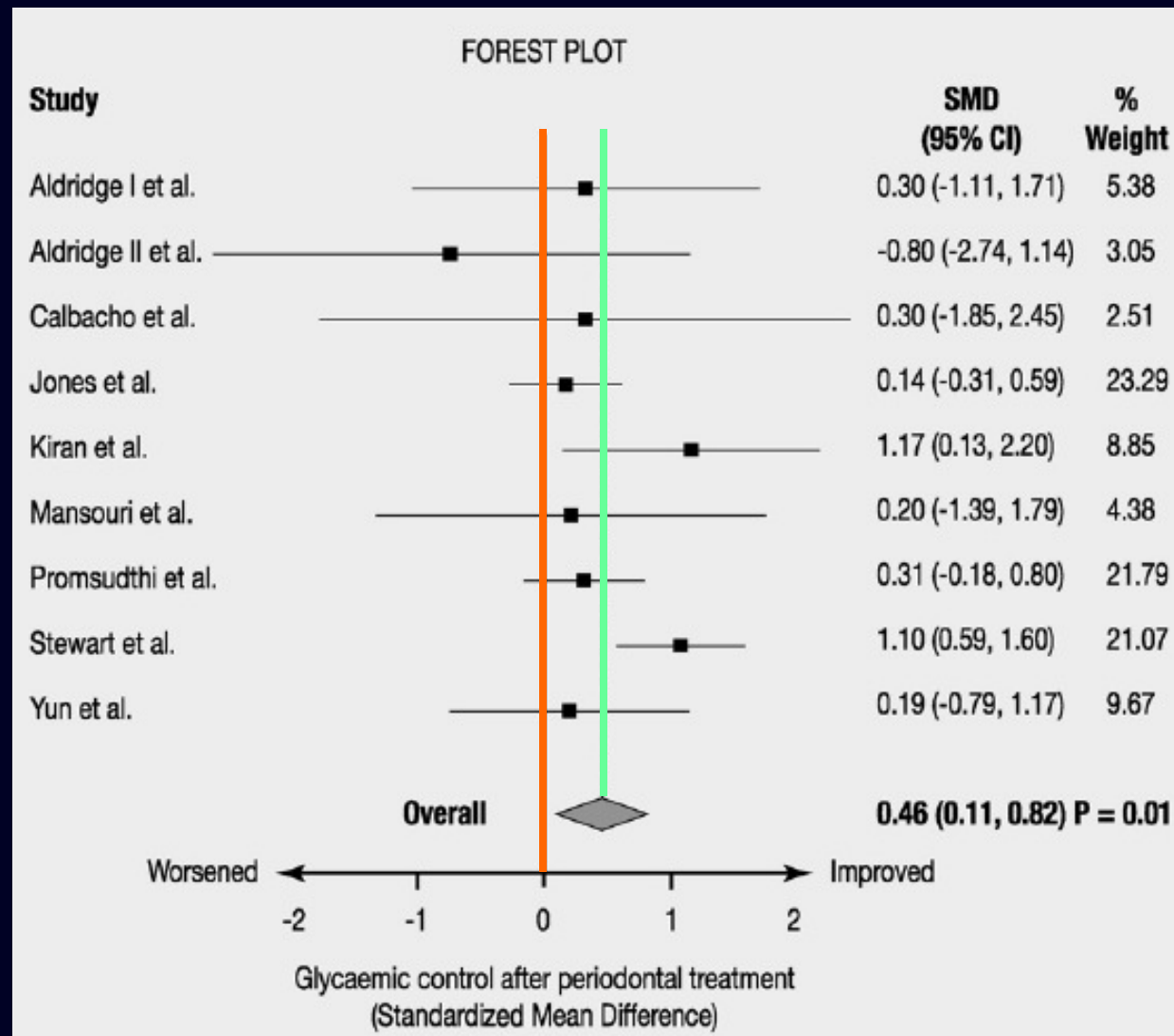
Janket et al. *J Dent Res*, 2005



	Weighted Average Change in HbA1c	95% Confidence Interval
All intervention studies	-0.4%	-1.5, 0.7
Studies of type 2 DM only	-0.7%	-2.2, 0.9
Non-surgical debridement only	-0.4%	-2.1, 1.3
Antimicrobial intervention in type 2 diabetic patients	-0.7%	-2.3, 0.9

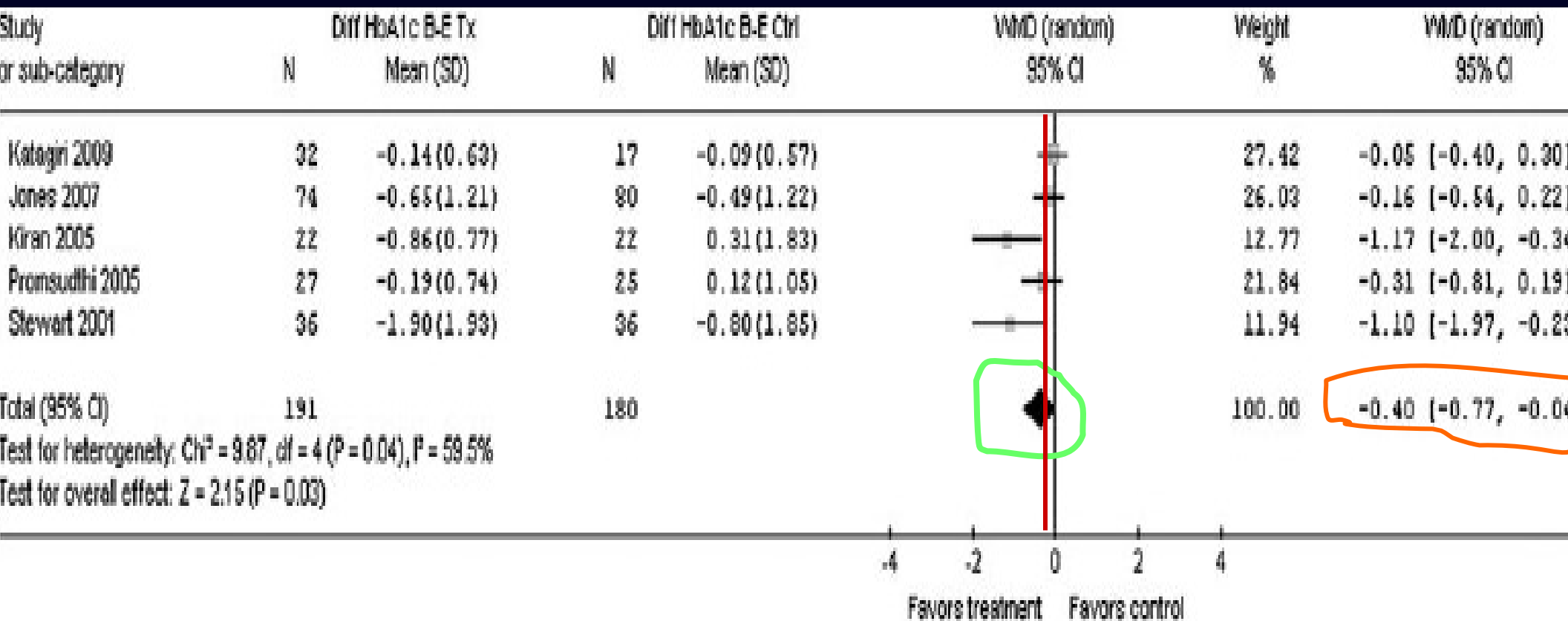
Non-surgical periodontal therapy: a meta-analysis.

Darré et al. *Diabetes and Metabolism*, 2008



Non-surgical periodontal therapy: a meta-analysis.

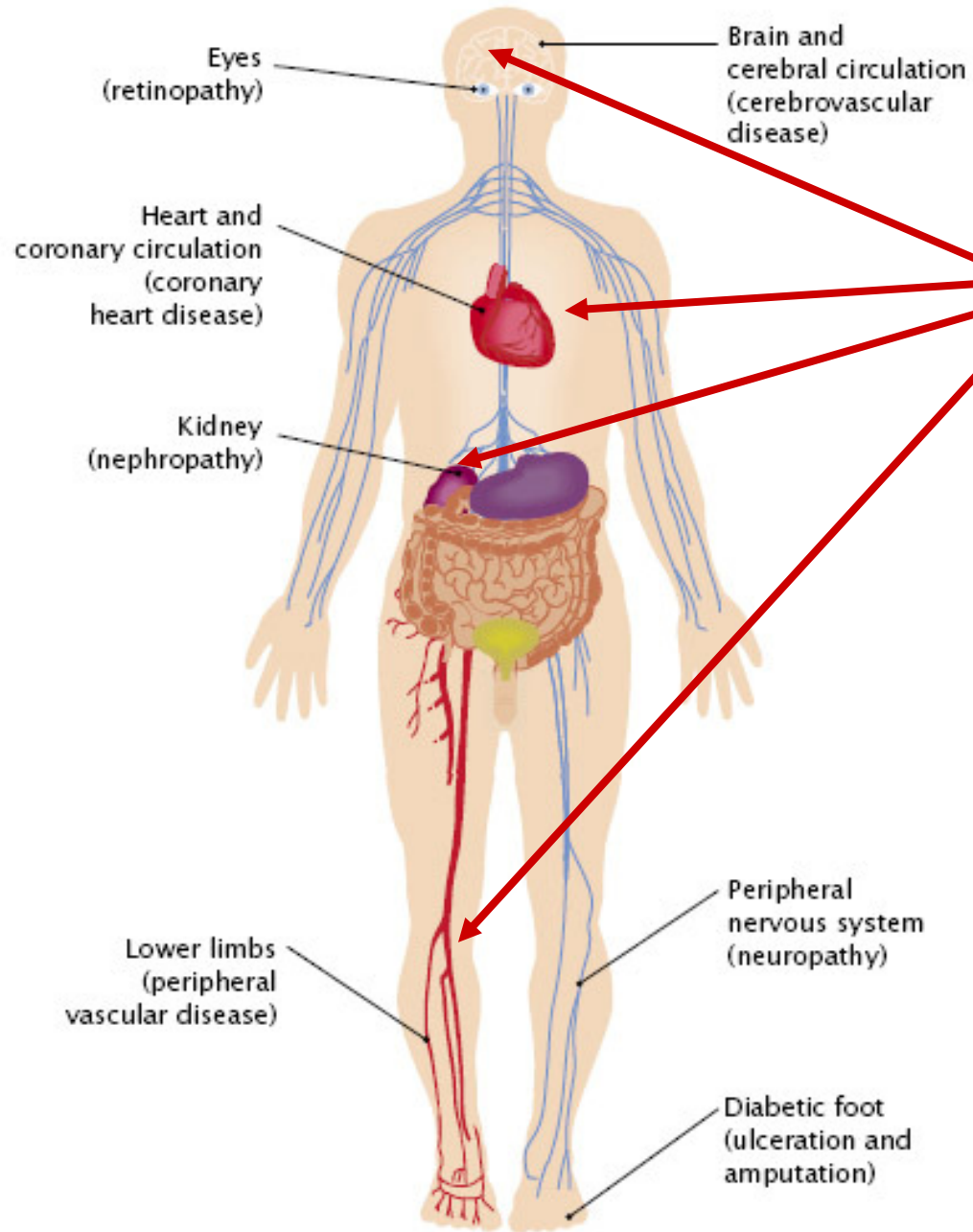
Teeuw et al. *Diabetes Care*, 2010



Periodontal Disease and Complications of Diabetes

*Periodontal disease and diabetes
complications*

The major diabetic complications



Landmark clinical trials demonstrating the significance of improving of glycemic control

- ◆ Diabetes Control and Complications Trial (DCCT)
 - ◆ Intensive blood glucose control in type 1 diabetes
 - ◆ 35% to 70% reduction in risk of retinopathy, nephropathy and neuropathy
- ◆ UK Prospective Diabetes Study (UKPDS)
 - ◆ Intensive blood glucose control in type 2 diabetes
 - ◆ 12% to 33% reduction in risk of retinopathy and nephropathy

Periodontal infection and complications of diabetes

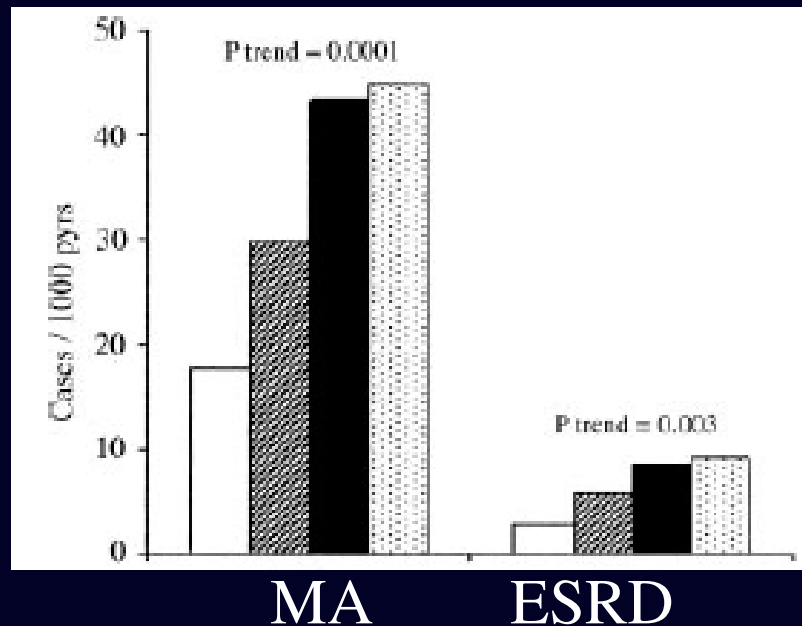
- ◆ Thorstensson et al., 1996; J Clin Periodontol.
 - ◆ 39 case-control pairs, type 1 and type 2 diabetes
 - ◆ Six years median follow-up period
 - ◆ Cases (severe periodontal disease) had greater risk for
 - ◆ Proteinuria
 - ◆ Cardiovascular complications: stroke, TIA, angina, myocardial infarction, and intermittent claudication

Periodontal infection and complications of diabetes

- ◆ Saremi et al., 2005; Diabetes Care.
 - ◆ Prospective cohort study of n=628, type 2 diabetes
 - ◆ Severe periodontal disease: 3.2x greater risk for cardiorenal mortality (ischemic heart disease and nephropathy)
 - ◆ Controlled for established risk factors: age, sex, duration, BMI, hypertension, blood glucose, cholesterol, ECG abnormalities, macroalbuminuria, and smoking

Periodontal infection and complications of diabetes: Overt nephropathy and ESRD

- ◆ Shultis et al., 2007; Diabetes Care.
 - ◆ Prospective cohort study of n=529, type 2 diabetes
 - ◆ Severe periodontal disease associated with incidence of macroalbuminuria and ESRD adjusted for age and sex



(n = 529). □, none/mild periodontitis; ▨, moderate periodontitis; ■, severe periodontitis; ▩, edentulous.

*Periodontal infection and complications of diabetes:
Overt nephropathy and ESRD
Shultis et al., 2007; Diabetes Care*

Macroalbuminuria

HRR

Mod Perio: 2.0 (1.2-3.5)

Sev Perio: 2.1 (1.2-3.8)

Edent: 2.6 (1.4-4.6)

n=193/529

ESRD

HRR

Mod Perio: 2.3 (0.6-8.1)

Sev Perio: 3.5 (0.96-12.4)

Edent: 4.9 (1.4-17.4)

n=68/529

Proportional Hazards Model: Adjusted for Age, Sex,
Diabetes Duration, BMI, and Smoking

Periodontal Disease As a Risk Indicator for Complications of Diabetes: NHANES III

- ◆ **Study design:** cross-sectional (1988-94)
- ◆ **Population:** U.S. adults with diabetes, ages 40+ (N=1,135)
- ◆ **Exposure:** PDz score: proportion of teeth with 4+mm attachment loss and bleeding and accounted for tooth loss
- ◆ **Comparison group:** Lowest quartile of PDz score
- ◆ **Outcome:** Quartiles 2, 3, & 4 had 2 x greater odds for having 1+ diabetes complications
 - ◆ Controlled for age, sex, race/ethnicity, income, smoking, health care visits, HTN, macroalbuminuria, cholesterol, HbA1c, and CRP

Periodontal Infection As a Risk Factor for Type 2 Diabetes: Emerging Evidence (Demmer et al., 2008)

- ◆ **Study design:** cohort, NHEFS, 1971 – 1992
- ◆ **Population:** U.S. adults (N=7,168), followed for 17 years (mean)
- ◆ **Exposure:** Periodontal disease at baseline
- ◆ **Comparison group:** No or mild periodontal disease at baseline
- ◆ **Outcome:** Periodontal disease at baseline independently associated with 50-100% greater risk for type 2 diabetes incidence
 - ◆ Controlled for demographics, SES, smoking, exercise, adiposity, hypertension, cholesterol, diet and WBC

*Periodontal Treatment and Medical Care Costs
in People with Diabetes*

Specific Aims

- ◆ To determine the association between periodontal treatment for people with diabetes and ...
 - ◆ AIM 1: Total medical care costs
 - ◆ AIM 2: Costs for medical care specifically related to diabetes and its complications
 - ◆ AIM 3: Costs for medical care related to specific complications and combinations of complications

Study population (N=2,674)

- ◆ Age 18 to 64 years
- ◆ Diagnosis of diabetes for at least 6 months
- ◆ Simultaneous, continuous enrollment in following product lines for at least one year of the 2001-2005 study period:
 - 1) Blue Cross Blue Shield
 - 2) Pharmaceutical insurance plan
 - 3) Dental insurance plan

Principal exposure: Non-surgical Periodontal Treatment and Prophylaxis Procedures (NSPP)

◆ Rationale:

- ◆ Procedures likely to have an effect on reducing gingival and periodontal inflammation
- ◆ Gingival and periodontal inflammation hypothesized to have an adverse effect on glycemic control

◆ Procedures types included

- ◆ Adult prophylaxis
- ◆ Scaling and root planing
- ◆ Periodontal maintenance procedures
- ◆ Debridement

◆ Exposure variable description

- ◆ Number of non-surgical periodontal and prophylaxis procedures over entire enrollment period of study

Other Predictor Variables

◆ Member characteristics

- ◆ Age in 2001
- ◆ Gender
- ◆ Presence of diabetes complications
- ◆ HbA1c test during coverage period
- ◆ Year of enrollment for member's record (i.e. 2001, ..., 2005)

◆ Contextural characteristics

- ◆ % African American in member's county
- ◆ % Hispanic/Latino in member's county
- ◆ Income per capita in member's county

GEE Regression Model of Costs

Outcomes

1. Total medical costs
2. Total medical and Rx costs
3. Diabetes-related costs
4. Diabetes compl. costs
5. Diabetes compl. combination costs

Predictor Variables (i.e. Covariates)

Intercept + β_1 *NSSPcat1 + β_2 *NSSPcat2 +
+ β_3 *NSSPcat3 + β_4 *Age2001 + β_5 *Female +
+ β_6 *Compl + β_7 *AnyHbA1c + β_8 *%AfrAm +
+ β_9 *%Hispanic/Latino + β_{10} *Income +
+ β_{11} *Year (01-05)

AIM 1: Total medical expenditures
% Lower expenditures

Type of Cost	N	<u>NSPP procedures</u>			0 / year
		1-2 / year	3-4/ year	>4/ year	
Medical only	2674	-11.6%	-11.9%		referent
Medical and Rx	2674	-10.0%	-9.1%	-18.5%	referent

*AIM 2: Diabetes-related costs:
% Lower expenditures*

Type of Cost	N	<u>NSPP procedures</u>			0 / year
		1-2 / year	3-4/ year	>4/ year	
DM medical	2506	-14.3%	-19.4%		referent
DM medical & Rx	2565	-9.3%	-11.6%		referent

*AIM 3: Diabetes complications:
% Lower expenditures*

NSPP procedures

Type of Cost	N	1-2 / year	3-4/ year	>4/ year	0 / year
CVD	1913	-28.2%	-37.6%	-50.9%	referent
PVD	380		-58.4%		referent
CHD	895	-34.5%	-52.4%		referent
CHF	190	-54.1%	-72.2%		referent

*AIM 3: Diabetes complications, con't.:
% Lower expenditures*

NSPP procedures

Type of Cost	N	1-2 / year	3-4/ year	>4/ year	0 / year
CKD	298	-48.3%	-71.5%		referent
Retinop/Eye disorders	940	-30.2%	-30.3%		referent
Neuropathy	607				referent
CVD& CKD	278	-34.8%	-66.3%		referent

Conclusions

- ◆ Evidence that chronic periodontitis may contribute to insulin resistance
- ◆ Evidence that treating periodontal infection may:
 - ◆ Lead to improved glycemic control
 - ◆ Possibly contribute to lower medical care costs
- ◆ Evidence that periodontal infection
 - ◆ Contributes to the risk for complications of diabetes
 - ◆ Contributes to the development of diabetes itself

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Thank you for your attention

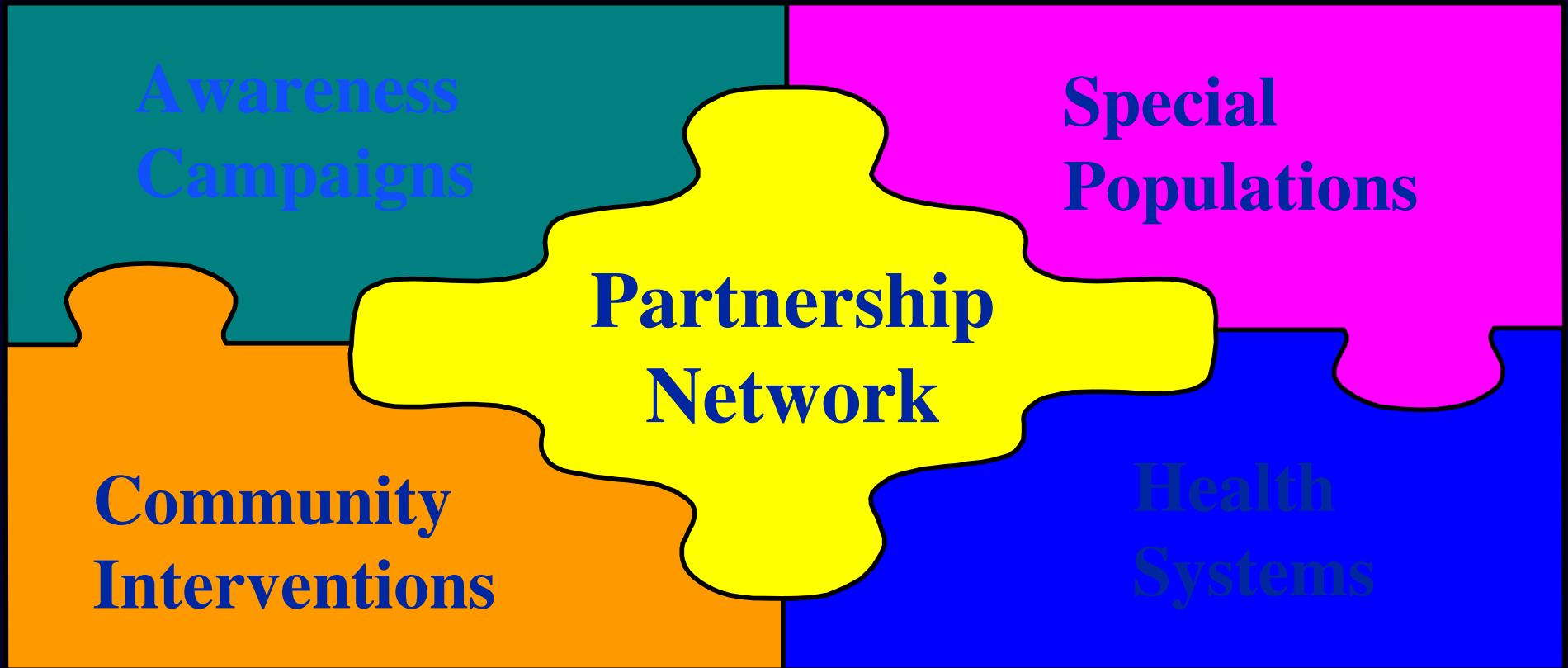


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National Diabetes Education Program

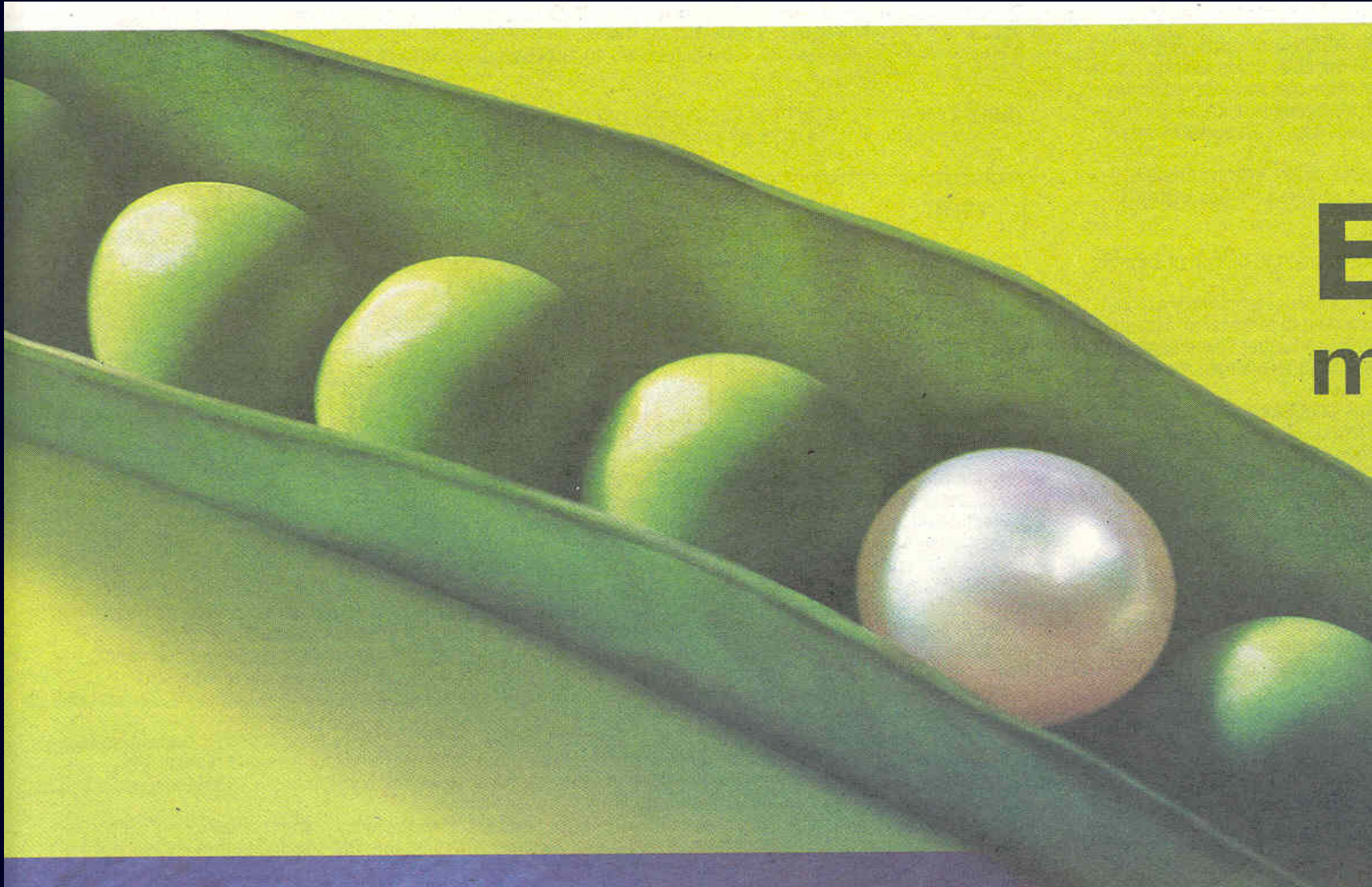


A joint initiative of CDC and NIH

NDEP structure

- ◆ Joint initiative of CDC and NIH
- ◆ Partnership with over 200 organizations
 - ◆ Public and private organizations
 - ◆ Traditional (e.g., American Diabetes Association) and non-traditional (National Urban League) partners
 - ◆ Diabetes Prevention and Control Programs
- ◆ Program goal: To reduce the morbidity and mortality associated with diabetes and its complications by changing the way diabetes treated

*PPOD is NOT a Vegetable:
It is an NDEP Resource*



WORKING TOGETHER TO MANAGE DIABETES



**A GUIDE FOR PHARMACISTS,
PODIATRISTS, OPTOMETRISTS, AND
DENTAL PROFESSIONALS**

PPOD Primer

- ◆ Focus on comprehensive, interdisciplinary diabetes care
- ◆ Section on “What You As A Health Care Provider Care Do” for all HCP
- ◆ Educate PPOD providers so they can educate patients in turn
- ◆ Sections specific to each discipline:
 - ◆ Key issues in each PPOD discipline
 - ◆ Recommendations RE referrals
 - ◆ Expanded information on PPOD provider’s role

CONTROL THE ABCs OF DIABETES

A1C – This test measures your overall blood glucose levels over the last 2 months

B BLOOD PRESSURE – High blood pressure increases heart disease

C CHOLESTEROL – Bad cholesterol, or LDL, builds up and clogs your arteries and increases your risk of heart disease and stroke

TELL YOUR HEALTH CARE PROVIDER HOW YOU WANT TO CONTROL YOUR DIABETES

MEDICATION MANAGEMENT



Take a MyA1C Action Plan now &!

- Make sure you take your medication, including their strengths and the way you take them (with or without your body's help). Don't forget to check your glucose when you start, stop, or change your medication.
- Update your list of current and past medications & all lab test results.
- Check with your pharmacist about supplies to get the best results at the lowest cost.

FOOT CARE



Take a MyA1C Action Plan now &!

- Get a complete foot exam at least once a year.
- Check with your doctor about any foot problems you may have.
- Find the right footwear for you.

EYE CARE



Take a MyA1C Action Plan now &!

- If you already have diabetes, you should get a complete eye exam every 1-2 years, or more often if you have any eye problems.
- Check with your doctor about your blood glucose levels like you'd check your cholesterol.
- Tell your doctor about any eye problems you have.

DENTAL CARE



Take a MyA1C Action Plan now &!

- Get a complete dental exam at least once a year to check for cavities or tooth decay.
- Let your dentist know about your blood glucose levels, including the ability to notice signs of tooth, mouth, and gum problems.
- Check with your dentist about your blood glucose and gum health.

OTHER THINGS YOU CAN DO

Get Physical – Be more active: walk, jog, swim, bike, or dance

Eat a Healthy Diet – Choose grains, fruits, vegetables, and low-fat dairy

Quit Smoking – Treatment is now available to help you quit

TELL YOUR PROVIDER HOW YOU WANT TO CONTROL YOUR DIABETES

FOR FREE INFORMATION AND SUPPORT, CALL 1-800-458-5231



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one click
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NDEP
National Diabetes Education Program

Your Source for Free Diabetes Information

A message from the National Diabetes Education Program, sponsored by the National Institutes of Health and the Centers for Disease Control and Prevention.

The graphic features a blue telephone handset at the top, a computer mouse at the bottom, and the NDEP logo in the center. The text is arranged in a clean, professional layout with a blue and white color scheme.