Foundations of the Social-ecological Approach to Employee Health Risk Factor Reduction in the Workplace

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Outline

1. **Theory: Stokols et al.**—the “health promotive capacity of human environments”

2. **Formative Research: Oldenburg et al.**—the “Checklist for Health Promotion Environments at Worksites” (CHEW)

3. **Field Research: Ross and Manocchia**—the “Worksites overweight/obesity control/prevention trial”

4. **Translation: Manocchia and Ross**—the “Organizational Risk Assessment” (ORA)
1. Theory: Stokols 1992


- Earlier research on health promotion has emphasized behavior change strategies rather than environmentally focused interventions.

- The author offers a social ecological analysis of health promotive environments, emphasizing the transactions between individual or collective behavior and the health resources and constraints that exist in specific environmental settings.
Theory: Stokols 1996


- Health promotion programs often … are based on narrowly conceived conceptual models.

- For example, lifestyle modification programs typically emphasize individually focused behavior change strategies … neglecting the environmental underpinnings of health and illness.

- Core principles of social ecological theory are used to derive practical guidelines for designing and evaluating community health promotion programs [and for] examining the role of intermediaries (e.g., corporate decision-makers, legislators).
Theory: Stokols 1996


- new research and policy [on] worksite health [posit]
  - joint influence of physical and social environmental factors on occupational health
  - effects of non-occupational settings (e.g., households, the health care system) on employee well-being.

- paradigm shift away from individually oriented wellness programs (provided at the worksite … aimed at changing employees' health behavior)
  - toward broader formulations emphasizing the joint impact of the physical and social environment at work, job-person fit, and work policies on employee well-being.
Theory: Stokols 2003


- This article offers an integration of two different perspectives … community capacity for health improvement and … health supportive environments [namely]
  - the cultivation of human resources (e.g., collaborative coalitions, participatory decision-making, health education strategies)
  - the influence of material resources (e.g., the built environment, natural resources, technological infrastructure) on important health behaviors and outcomes.

- Combining [these two] yields a broader understanding of the health promotive capacity of human environments….
2. Formative Research: Oldenburg 2002


- **PURPOSE:** Health promotion policy frameworks, recent theorizing, and research all emphasize understanding and mobilizing environmental influences to change particular health-related behaviors in specific settings. The workplace is a key environmental setting.

- The Checklist of Health Promotion Environments at Worksites (CHEW) was designed as a direct observation instrument to assess characteristics of worksite environments that are known to influence health-related behaviors.
METHODS: The CHEW is a 112-item checklist of workplace environmental features hypothesized to be associated, both positively and negatively, with physical activity, healthy eating, alcohol consumption, and smoking.

The three environmental domains assessed are (1) physical characteristics of the worksite, (2) features of the information environment, (3) characteristics of the immediate neighborhood around the workplace.

The conceptual rationale and development studies for the CHEW are described, and data from observational studies of 20 worksites are reported.
• **RESULTS**: The data on CHEW-derived environmental attributes showed generally good reliability and identified meaningful sets of variables that plausibly may influence health-related behaviors.

• With the exception of one information environment attribute, intra-class correlation coefficients ranged from 0.80 to 1.00.

• Descriptive statistics on selected physical and information environment characteristics indicated that
  – vending machines, showers, bulletin boards, and signs prohibiting smoking were common
  – bicycle racks, visible stairways, and signs related to alcohol consumption, nutrition, and health promotion were relatively uncommon.
CONCLUSIONS: These findings illustrate the types of data on environmental attributes that can be derived, their relevance for program planning, and how they can characterize variability across worksites.

The CHEW is a promising observational measure that has the potential

– to assess environmental influences on health behaviors

– to evaluate workplace health promotion programs.
3. Field Research: Ross and Manocchia 2005-07

**R01 DP000108** “Worksites overweight/obesity control/prevention trial”

- Thirty-month (04/01/2005 - 09/29/2007), four-arm: 3 test, 1 control, 7 employers per arm (n=28), 957 active participants at study start. small employer: 51-249 employee worksites

- Cluster randomized control trial conducted at UVM in partnership with Blue Cross Blue Shield of Vermont.

- **Aim:** to gauge clinical and cost effectiveness—compared to Standard Worksite Wellness (SWW) no program/screening only—of three program approaches to worksite wellness:
  - Individual per se (IPS) = “Tailored Health Services.”
  - Environmental per se (EPS) = “Altered Worksite Settings.”
  - Integrated environmental + individual (IEI) = IPS + EPS.
Field Research: Ross and Manocchia
2005-07

**Test period:** P.I., Project Manager, Project Clinician

- manage site-level program delivery (PD) team implementation of agreements covering on-/off-site programming by Test sites.
- conduct Outcomes collection Baseline and three (3) Follow-up Clinics at Test and Control sites at which clinical and paper survey outcomes are collected.
- assess employer success implementing programs and employer evaluations of content and process of program implementation.

**Outcomes collection Clinics conducted**

- Baseline: October 21, ’05 – April 26, ’06
- 1st follow-up: April 27 – September 14, ’06
- 2nd follow-up: January 2 – February 22, ’07
- 3rd follow-up: July 26 – September 28, ‘07
**Field Research: Ross and Manocchia 2005-07**

- **IPS intervention** links individual health risk assessment to individual-level health risk-reduction programming, employing individual health risk screening and risk-reduction coaching as platform for delivering tailored health services (targeting unhealthy diet, physical inactivity, unmitigated stress, tobacco addiction) to sub-sets of employees identified according to risk.

- **EPS intervention** links environmental health risk assessment to environment-level health risk-reduction programming, employing worksite/building asset screening and asset-improvement coaching as platform for delivering altered worksite settings (targeting physical, informational, nutritional, grounds, neighboring, policy, educational environments) to all employees alike independent of risk.
Field Research: Ross and Manocchia 2005-07

• **The Facilitator:** IPS, EPS, IEI arms featured distinct program approaches to worksite wellness but one common facilitator, the Program Delivery (PD) team:

  – two-to-four (2-4) employee participants who cover four (4) distinct “Go-to” assignments (30-60 minute burden/week), e.g. for the Pedometer club, for the Buddy system.

  – meet weekly/bi-weekly (roundtable) to report, discuss, solve, propose, plan programming, monitoring, and evaluation.

• worked hand-in-glove with the Research team in the pre-Test and Test periods to design and implement the intervention.
Field Research: Ross and Manocchia 2005-07

• The “Translators”: IPS, EPS, IEI arms featured distinct program approaches to worksite wellness but two common translators:

  – Pedometer club, to promote daily individual or group walking and, by means of six-week Walking logs, daily/weekly step-counting/building.

  – Buddy system, to promote formation of buddy groups: two-to-five (2-5) participants committed to regular shared activity around modifying one behavioral health risk factor: unhealthy diet, physical inactivity, unmitigated stress, tobacco addiction.

• worked hand-in-glove with the Research team in Test period to distribute, collect Walking logs, facilitate, monitor, evaluate Buddy groups.
Field Research: Ross and Manocchia 2005-07

- **Delivery systems**: Ips, Eps, Iei arms alike featured Pedometer clubs and Buddy groups but the manner in which these were promoted differed according to the distinct nature of the intervention:
  
  - **the IPS** promoted activity always by individual means, involving personalized, face-to-face invitations and encouragements.
  
  - **the EPS** promoted activity always by environmental means, involving socially marketed invitations and encouragements.
  
  - **the IEI** promoted activity always by a combination of individual and environmental means.
Field Research: Ross and Manocchia 2005-07

• Clinician-reported Outcomes measures
  – Waist circumference: overweight = >35/women, >40/men.
  – Lipids: total cholesterol, HDL, LDL, triglycerides.
  – Glucose: blood sugar.

• Participant-reported Outcomes measures
  – Physical, mental health status: SF12 Health survey (physical and mental component summary scales).
  – Work limitations: Work Limitations Questionnaire/WLQ-8 (percent of work time when tasks are difficult to perform: time, physical, mental, output demands).
Chart 1. Baseline to Six Month Changes
Chart 2. Baseline to Six Month Changes

- Total Cholesterol
- Triglycerides (Trig)
- Low-Density Lipoprotein (LDL)
- High-Density Lipoprotein (HDL)
- Glucose

Change Scores:
- Total Cholesterol: -8.3, -12.8
- Triglycerides: -6.3, -14.0
- LDL: -9.2, -16.2
- HDL: -5.4, -10.9
- Glucose: 0.2, 0.4

Categories:
- EPS
- IEI
- IPS
- SWW

Change Score Ranges:
- Total Cholesterol: -18.0 to -2.0
- Triglycerides: -16.0 to -8.0
- LDL: -10.0 to -8.0
- HDL: -9.7 to -9.9
- Glucose: 0.2 to 4.8
Chart 3. Baseline to 12 Month Changes

BMI  Waist  Weight  Systolic  Diastolic

EPS  IEI  IPS  SWW

-2.0 -2.1 -1.1 -0.8  0.4  0.6  0.5  1.8

-5.0 -3.7 -1.8 -0.7 -0.8  -1.4  1.3  1.3

0.2  0.2  0.4  0.3

Field Research: Ross and Manocchia 2005-07
Chart 4. Baseline to 12 Month Changes

<table>
<thead>
<tr>
<th></th>
<th>Total Cholesterol</th>
<th>Trig</th>
<th>LDL</th>
<th>HDL</th>
<th>Glucose</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPS</td>
<td>-8.1</td>
<td>0.5</td>
<td>-5.0</td>
<td>-3.4</td>
<td>10.2</td>
</tr>
<tr>
<td>IEI</td>
<td>-7.2</td>
<td>-2.3</td>
<td>-3.3</td>
<td>-2.4</td>
<td>8.9</td>
</tr>
<tr>
<td>IPS</td>
<td></td>
<td>-3.0</td>
<td>-2.4</td>
<td>-5.6</td>
<td>4.6</td>
</tr>
<tr>
<td>SWW</td>
<td></td>
<td>-4.1</td>
<td>-3.3</td>
<td>-3.3</td>
<td>5.2</td>
</tr>
</tbody>
</table>
Chart 5. Baseline to 18 Month Changes

- BMI: -11.7
- Waist: -8.1
- Weight: -6.7
- Systolic: -5.2
- Diastolic: -3.6

Indicators:
- EPS
- IEI
- IPS
- SWW
Chart 6. Baseline to 18 Month Changes

- Total Cholesterol
- Trig
- LDL
- HDL
- Glucose

<table>
<thead>
<tr>
<th></th>
<th>EPS</th>
<th>IEI</th>
<th>IPS</th>
<th>SWW</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Cholesterol</td>
<td>-22.9</td>
<td>-24.6</td>
<td>19.6</td>
<td>9.2</td>
</tr>
<tr>
<td>Trig</td>
<td>-11.4</td>
<td>-9.6</td>
<td>9.6</td>
<td>-1.3</td>
</tr>
<tr>
<td>LDL</td>
<td>-14.4</td>
<td>-14.0</td>
<td>4.0</td>
<td>4.0</td>
</tr>
<tr>
<td>HDL</td>
<td>-7.5</td>
<td>-9.3</td>
<td>8.3</td>
<td>-9.5</td>
</tr>
<tr>
<td>Glucose</td>
<td>6.5</td>
<td>3.4</td>
<td>2.1</td>
<td>2.4</td>
</tr>
</tbody>
</table>
The frequencies-based results reported in Charts 1-6 support the “dosage exposure” hypothesis.

- **With prediction**, the combined-program IEI arm ranks first, ahead of the single-program EPS and IPS and the no-program SWW arms; the single-program EPS and IPS arms rank between, lower than the combined-program IEI but higher than the no-program SWW arms; the no-program SWW arm ranks last, behind the combined-program IEI and single-program EPS and IPS arms.

- **Against prediction**, the single-program EPS is a closer second than the IPS to the combined-program IEI arm.
Field Research: Ross and Manocchia
2005-07

- **Baseline to 6-month Follow-up**, the IEI performs as predicted 7-in-10 times; SWW as predicted 6-in-10 times (but not 4-in-10 times); EPS and IPS each as predicted 5-in-10 times; EPS and IPS over-perform and under-perform equally by count (5-in-10 times) and proportion (2:3 or 3:2 over-to-under-perform);

- **Baseline to 12-month Follow-up**, the IEI performs as predicted 6-in-10 times; SWW as predicted 7-in-10 times (but not 3-in-10 times); EPS and IPS as predicted, respectively, just 3-in-10 and 4-in-10 times; EPS and IPS over-perform unequally (EPS 5-in-10, IPS 2-in-10), under-perform equally (2-in-10 times);

- **Baseline to 18-month Follow-up**, the IEI performs as predicted 6-in-10 times; SWW as predicted 7-in-10 times (but not 3-in-10 times); EPS and IPS as predicted, respectively, just 3-in-10 and 1-in-10 times; EPS and IPS over-perform equally (4-in-10 times), under-perform equally (2-in-10 times).
Chart 7. Average Monthly Medical Claims Cost by study arm: 12 mos pre-intervention vs. 18 mos intervention period
Chart 8. Average Monthly Pharmaceutical Claims Cost by study arm: 12 mos pre-intervention vs. 18 mos intervention period
Chart 9. Average Monthly Total Claims Cost by study arm: 12 mos pre-intervention vs. 18 mos intervention period

- **IEI**: 12 Month Pre-Intervention Period - $135,
  Expected 18 Month Value - $113,
  18 Month Intervention Period - $157

- **IPS**: 12 Month Pre-Intervention Period - $94,
  Expected 18 Month Value - $110,
  18 Month Intervention Period - $98

- **EPS**: 12 Month Pre-Intervention Period - $207,
  Expected 18 Month Value - $241

- **SSW**: 12 Month Pre-Intervention Period - $138,
  Expected 18 Month Value - $137,
  18 Month Intervention Period - $146

- **All**: 12 Month Pre-Intervention Period - $146,
  Expected 18 Month Value - $171,
  18 Month Intervention Period - $166
Field Research: Ross and Manocchia 2005-07

- **Insurer-reported outcomes** for insured participants who completed the full 18-month intervention (n=401) compare 12-month pre-Intervention period to 18-month Intervention period average monthly cost on medical and pharmaceutical claims.

  - **Claims-based results** support the “dosage exposure” hypothesis that the combined-program arm (IEI) will report significantly more positive outcomes than either single-program arm (IPS, EPS).

  - **With prediction**, the IEI arm observably ranks first on claims performance (registering cost saving).
Field Research: Ross and Manocchia
2005-07

• **Conclusion:** Savings are maximized when individual (IPS) and environmental (EPS) programs are combined. Accordingly, participants exposed to the IEI intervention (n=85, EPS n=112, IPS n=97, SWW=107) went from

  – **unadjusted:** average monthly total claims cost ($2005-07) of $135.40 (pre-Intervention) to $113.22 (Intervention) for a savings of $22.18.
  • Annualized this is a savings of $266 per employee or $26,616 per 100 employees.

  – **adjusted** (for actual 2005-2007 percentage rise in employer premiums rates): average monthly total claims cost ($2005-07) of $156.95 (pre-Intervention) to $113.22 (Intervention) for a savings of $43.73.
  • Annualized this is a savings of $525 per employee or $52,476 per 100 employees.
Field Research: Ross and Manocchia 2005-07

Cost effectiveness outcomes

### Table 1. Worksites trial Cost effectiveness ratios by study arm (n=4: IEI, IPS, EPS, SWW)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Test 1: IEI arm</th>
<th>Test 2: IPS arm</th>
<th>Test 3: EPS arm</th>
<th>Control: SWW arm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change in cost from baseline per subject</td>
<td>$2,103</td>
<td>$1,895</td>
<td>$1,112</td>
<td>$904</td>
</tr>
<tr>
<td>Change in Systolic Blood Pressure from baseline</td>
<td>-8.53</td>
<td>-3.18</td>
<td>-7.16</td>
<td>-1.82</td>
</tr>
<tr>
<td>Cost/unit change in Sys Blood Pressure</td>
<td>N/A</td>
<td>$596</td>
<td>N/A</td>
<td>$497</td>
</tr>
<tr>
<td>Change in Total Cholesterol from baseline</td>
<td>-24.76</td>
<td>-6.22</td>
<td>-20.40</td>
<td>-1.86</td>
</tr>
<tr>
<td>Cost/unit change in Total Cholesterol</td>
<td>N/A</td>
<td>$305</td>
<td>N/A</td>
<td>$487</td>
</tr>
</tbody>
</table>
Field Research: Ross and Manocchia
2005-07

Cost-effectiveness analysis (CEA)

- **Cost (ratio numerator):** employer-reported fixed and variable cost of implementing screening plus programming (test arms) and screening only (control arm) and employee participation cost as well as insurer-reported pre/post medical and pharmaceutical claims cost change.

- **Effectiveness (ratio denominator):** employee participant pre/post health risk factors incl. weight and waist circumference, blood pressure (Systolic, Diastolic), lipids (Total cholesterol, HDL-cholesterol), glucose (blood sugar).

Compared to control (Table 1)

- **Systolic blood pressure:** the EPS arm was found 3.55 (cost per unit change) more cost effective than the IPS ($497:$140) and 4.26 more cost effective than the IEI ($596:$140) arm.

- **Total Cholesterol:** the EPS arm was found 2.52 (cost per unit change) more cost effective than the IPS ($487:$193) and 1.58 (cost per unit change) more cost effective than the IPS+EPS ($305:$193).