Neighborhood Disadvantage and Transitional Care for Persons with Dementia

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Overarching Goal

- Develop **practical** approaches towards the **elimination of AD health disparities** across all vulnerable populations **nationally**

  - “Big Data”- geo-linked sets of >59 million subjects; large computing capacity
    - Policy
    - Program targeting

  - Engineer sustainable, feasible and effective models of care adaptable to low-resource settings
Improving Health
How Can We Meaningfully Improve Health in Disadvantaged Contexts?
Socioeconomic Disadvantage

- The state of being challenged by low income, limited education, and substandard living conditions for both the person and his or her social network*

CDC Health Impact Pyramid
Factors that Affect Health

Socioeconomic Factors

Changing the Context to make individuals' default decisions healthy

Long-lasting Protective Interventions

Clinical Interventions

Counseling & Education

Examples

Eating healthy, being physically active

Rx for high blood pressure, high cholesterol, diabetes

Immunizations, brief intervention, cessation treatment, colonoscopy

Fluoridation, trans fat, smoke-free laws, tobacco tax

Poverty, education, housing, inequality

Check the Tarrant County Public Health Web site to learn more.
http://health.tarrantcounty.com
Neighborhood Socioeconomic Disadvantage Impacts Health

- Associated with behaviors*, access to food**, safety†
- Linked to outcomes like mortality††, development of diabetes***, birth weight‡
- Health indicators improve with moving persons to areas of less concentrated poverty‡‡

Moving to Opportunity Study

- Sponsored by the US Dept of Housing and Urban Development (HUD)
- Random lottery (1994-1998) offered some public housing families, but not others, the chance to move into a less distressed (lower-poverty) neighborhood (N=4,604 families)
- Five cities: Baltimore, Boston, Chicago, Los Angeles, New York
- Data collected for 10-15 years post-randomization
  - Included measures on racial segregation of neighborhoods

Results

“Moving from a high-poverty to lower-poverty neighborhood leads to long-term improvements in adult physical and mental health and subjective well-being, despite not affecting economic self-sufficiency.”

Neighborhood Disadvantage

- Linked to health behavior promotion, access to food, toxic exposures and personal safety

Neighborhood Socioeconomic Disadvantage Increases Rehospitalization Risk

Living in a disadvantaged neighborhood is equivalent to having emphysema in terms of one’s rehospitalization risk.
**Levels of Analysis**

<table>
<thead>
<tr>
<th>Environmental</th>
<th>Sociocultural</th>
<th>Behavioral</th>
<th>Biological</th>
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<tr>
<td><strong>Geographical and Political Factors</strong></td>
<td><strong>Cultural Factors</strong></td>
<td><strong>Coping Factors</strong></td>
<td><strong>Physiological Indicators</strong></td>
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<td>Residential Segregation</td>
<td>Traditions</td>
<td>Cognitive Reframing</td>
<td>Inflammation</td>
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<td>Toxins/Exposures</td>
<td>Collective Responses</td>
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<thead>
<tr>
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<th><strong>Social Factors</strong></th>
<th><strong>Psychosocial Risk/Resilience</strong></th>
<th><strong>Genetic Stability</strong></th>
<th><strong>Cellular Function And Communication</strong></th>
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<td>Telomere Attrition</td>
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<td>Discrimination</td>
<td>Epigenetic Alteration</td>
<td>Mitochondrial Dysfunction</td>
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<td>Financial Stress</td>
<td>Pessimism</td>
<td>Loss of Proteostasis</td>
<td>Cellular Senescence</td>
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<tr>
<td>Limited English</td>
<td>Occupational Stress</td>
<td>Optimism</td>
<td></td>
<td>Cellular Stress Response</td>
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<td></td>
<td>Residential Stress</td>
<td>Control</td>
<td></td>
<td>Stem Cell Exhaustion</td>
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<td></td>
<td>Social Mobility</td>
<td></td>
<td></td>
<td>Intercellular Communication</td>
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<td></td>
<td>Social Network</td>
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<th><strong>Health Behaviors</strong></th>
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<td>Self Concepts</td>
<td>Smoking</td>
<td>Smoked</td>
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<td>Insurance</td>
<td>Stigma</td>
<td>Anger/Violence</td>
<td>EET Gg</td>
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<td>Bias</td>
<td>Alcohol/Drug</td>
<td>Rose Rg</td>
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<td>Literacy</td>
<td>Loneliness</td>
<td>Nutrition</td>
<td>Preliminary</td>
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<tr>
<td>Numeracy</td>
<td>Stereotypes</td>
<td>Physical Activity</td>
<td>Preliminary</td>
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*Lifecourse Perspective*

**Figure 2. NIA Health Disparities Research Framework**

* Sexual and gender minorities.
** Text within boxes represents examples of related factors.

*Hill et al, Ethn Dis, 2015*
Dementia and Disadvantage

- Dementia due to Alzheimer’s Disease (AD) disproportionately impacts racial/ethnic minorities and the socioeconomically disadvantaged—populations often exposed to US socioeconomic contextual disadvantage (“neighborhood disadvantage”)
  

- Neighborhood disadvantage is modifiable

- The impact of neighborhood disadvantage on the development of dementia remains unknown
Objective

- To examine the association between neighborhood disadvantage, baseline cognition, and CSF biomarkers of AD
Wisconsin Registry for Alzheimer’s Prevention (WRAP) Study

- Longitudinal study of asymptomatic middle-aged individuals enriched for parental AD history [Sager et al, J of Geri Psych and Neurology, 2005]

- Baseline cognitive testing to construct robust normative factor scores
  Immediate memory (Rey AVLT trails 1,2)
  Verbal learning (AVLT trials 3,4,5 and delayed recall)
  Working memory (digit span, letter-number sequencing)
  Speed/flexibility (Trails A/B, Stroop color-word task)

- CSF biomarkers collected for Aβ42 and P-tau181 [Racine et al, Neuroimage Clinical, 2014;
  Starks et al, J of AD, 2015; Palmqvist et al, JAMA Neurol, 2014; Starks et al, J of AD, 2015]
Methods

• Created, validated neighborhood-level quantifications of socioeconomic contextual disadvantage for the full US—over 50 million Zip+4 codes—employing latest American Community Survey and Census data

• This metric—the Area Deprivation Index (ADI)—incorporates poverty, education, housing and employment indicators; predicts disparity-related health outcomes; and is employed by Maryland and Medicare through our provision [https://www.linkedin.com/feed/update/urn:li:activity:6244899965945024512/]

• The ADI provides a novel, nationally-generalizable way to study impacts of exposure to neighborhood disadvantage, while simultaneously offering a practical option for resource and outreach targeting
Area Deprivation Index (ADI): A Measure of Neighborhood Disadvantage

- Theoretical Domains: Education, Poverty, Housing Quality, Unemployment
- Factor-based ranking index
- Census block group level

Table 1. Census Data Block Group Components and Factor Score Coefficients in the Singh ADI*

<table>
<thead>
<tr>
<th>Census Block Group Component</th>
<th>Factor Score Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage of population aged ≥25 y with &lt;9 y of education</td>
<td>0.0849</td>
</tr>
<tr>
<td>Percentage of population aged ≥25 y with at least a high school diploma</td>
<td>-0.0070</td>
</tr>
<tr>
<td>Percentage of employed persons aged ≥16 y in white collar occupations</td>
<td>-0.0874</td>
</tr>
<tr>
<td>Median family income</td>
<td>-0.0577</td>
</tr>
<tr>
<td>Income disparity</td>
<td>0.0536</td>
</tr>
<tr>
<td>Median home value</td>
<td>-0.0688</td>
</tr>
<tr>
<td>Median gross rent</td>
<td>-0.0781</td>
</tr>
<tr>
<td>Median monthly mortgage</td>
<td>-0.0770</td>
</tr>
<tr>
<td>Percentage of owner-occupied housing units (home ownership rate)</td>
<td>-0.0615</td>
</tr>
<tr>
<td>Percentage of civilian labor force population aged ≥16 y unemployed (unemployment rate)</td>
<td>0.0806</td>
</tr>
<tr>
<td>Percentage of families below the poverty level</td>
<td>0.0577</td>
</tr>
<tr>
<td>Percentage of population below 150% of the poverty threshold</td>
<td>0.1037</td>
</tr>
<tr>
<td>Percentage of single-parent households with children aged &lt;18 y</td>
<td>0.0719</td>
</tr>
<tr>
<td>Percentage of occupied housing units without a motor vehicle</td>
<td>0.0694</td>
</tr>
<tr>
<td>Percentage of occupied housing units without a telephone</td>
<td>0.0877</td>
</tr>
<tr>
<td>Percentage of occupied housing units without complete plumbing (log)</td>
<td>0.0510</td>
</tr>
<tr>
<td>Percentage of occupied housing units with &gt;1 person per room (crowding)</td>
<td>0.0556</td>
</tr>
</tbody>
</table>

ADI = area deprivation index.
* Components and factor score coefficients drawn from reference 28. All coefficients are multiplied by -1 to ease interpretation (greater ADI means greater disadvantage).
† Income disparity defined by Singh as the log of 100 * ratio of the number of households with <$10,000 annual income to the number of households with $50,000 annual income.

[Kind et al, Annals of Internal Medicine, 2014]
Typical Geo-Political Boundaries
Neighborhood Disadvantage by ADI
Neighborhood Disadvantage by ADI
Neighborhood Disadvantage by ADI
Limitations

• Unclear generalizability beyond the state of Wisconsin

• Limited number of CSF samples from participants within the most disadvantaged neighborhoods limits analytic power within biomarker analyses. Future studies will include larger participant numbers

• Interactions amongst neighborhood disadvantage and other fundamental factors (including race, genetics, etc.) will be examined within future studies.
Conclusions

- These early data suggest that neighborhood disadvantage (a modifiable fundamental risk factor) may account for some of the observed disparities in prevalence of dementia.

- Given the urgent need to reduce dementia and AD disparities, the current results suggest that neighborhood disadvantage deserves additional study.
Case: One of Many...

- 78yo hospitalized with pneumonia
- Mild dementia, not recognized
- Discharged on oral antibiotic x 7 days
- Discharge teaching performed once (intensively) on the day of discharge. Caregiver not notified. (Daughter working 2 jobs to make ends meet.) Home health won’t visit due to neighborhood safety concerns.
- Rehospitalized 3 days later; recurrent pneumonia
  - Antibiotic prescription found in patient’s pocket. He forgot to fill the medication.

How Can We Help?
Transitional Care

- Broadly, a set of actions designed to ensure the coordination and continuity of health care as patients transfer between different locations or different levels of care in the same location*

* Coleman. JAGS. 2003
Concept for Comprehensive Post-Hospital Transitional Care

Hospitalized Population

Highest-Risk Patients
* Patient must be geographically close & agreeable to a home-visit

All Hospitalized Patients

Strong Discharge Practices
- Medication Reconciliation
- Discharge Teaching/Materials
- Medical Follow-Up Plans
- Quality Discharge Documentation

* Programs are additive. They are not mutually-exclusive.

Unpublished figure, © Amy JH Kind, MD, PhD
Unmet Need

- Many of the patients who need special care to support their post-hospital transition cannot access such services
  - Socioeconomically disadvantaged populations
  - Areas with poor health care access

- We need programs that adapt, succeed and sustain in underserved and disadvantaged areas
Coordinated-Transitional Care Program (C-TraC)
Concept for Comprehensive Post-Hospital Transitional Care

Hospitalized Population

Highest-Risk Patients
* Patient must be geographically close & agreeable to a home-visit
* Could be identified by C-TraC nurses in addition to pre-defined patient characteristics

All Higher-Risk Patients
* Examples: cognitively impaired or lives-alone or prior hospitalization or medically complex

All Hospitalized Patients

Home-Visit Based Transitional Care Program

Coordinated Transitional Care Program (C-TraC)
- Hospital-Based C-TraC Nurses
- Outpatient Integration

Strong Discharge Practices
- Medication Reconciliation
- Discharge Teaching/Materials
- Medical Follow-Up Plans
- Quality Discharge Documentation

* Programs are additive. They are not mutually-exclusive.

Unpublished figure, © Amy JH Kind, MD, PhD
C-TraC Goals

1. Educate and empower the patient/caregiver in medication management
2. Ensure the patient/caregiver has medical follow-up
3. Educate the patient/caregiver regarding red flags
4. Ensure the patient/caregiver knows whom to contact if questions arise

* Kind, Health Affairs, 2012.
Coordinated-Transitional Care (C-TraC) Program

* Kind at al, JAGS, 2016
Pilot Data: C-TraC Cut Rehospitalizations in Patients with Dementia

- 20% of intervention patients versus 33% of comparison patients experienced a 30-day rehospitalization (p-value = 0.03)

### Adjusted Odds Ratios for 30-Day Rehospitalization for Patients with Dementia in C-TraC versus Baseline

<table>
<thead>
<tr>
<th>C-TraC Group Participants with Dementia</th>
<th>30 Day Rehospitalization</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Adjusted**</td>
</tr>
<tr>
<td></td>
<td>Odds Ratio</td>
</tr>
<tr>
<td>Baseline period, n = 64</td>
<td>1.00</td>
</tr>
<tr>
<td>Intervention period, n = 81</td>
<td>0.34</td>
</tr>
</tbody>
</table>

**Multivariate logistic regression model adjusted for veteran age, gender, race, Medicaid status, education level, and charlson comorbidity score
The Coordinated-Transitional Care (C-TraC) Program

Net cost avoidance of over $1,200 per patient served

Patients and caregivers reported high satisfaction, decreased caregiver stress, improved medication management skills

CONCLUSION: C-TraC shows promise for improving the post-hospital outcomes of AD patients
## CTRAC (Madison WI) FY 2011-2012

<table>
<thead>
<tr>
<th></th>
<th>Enrollees (N=387)</th>
<th>Comparisons (N=2,126)</th>
<th>Difference</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>30-day post-discharge rehospitalization rate (VA inpatient)</strong></td>
<td>7.5%</td>
<td>11.1%</td>
<td>-3.6%</td>
<td>0.019</td>
</tr>
<tr>
<td><strong>30-day rehospitalization rate (VA or Medicare inpatient)</strong></td>
<td>9.8%</td>
<td>14.9%</td>
<td>-5.0%</td>
<td>0.004</td>
</tr>
<tr>
<td>Any use of inpatient, ER or observation days within 30-day of discharge (VA or Medicare)</td>
<td>11.1%</td>
<td>17.2%</td>
<td>-6.1%</td>
<td>0.001</td>
</tr>
<tr>
<td><strong>Total VA costs 30-days post discharge</strong></td>
<td>$4,585</td>
<td>$6,081</td>
<td>-$1,496</td>
<td>0.006</td>
</tr>
<tr>
<td><strong>30-day mortality</strong></td>
<td>5.7%</td>
<td>4.5%</td>
<td>1.2%</td>
<td>0.327</td>
</tr>
<tr>
<td><strong>90 day mortality</strong></td>
<td>8.8%</td>
<td>9.3%</td>
<td>-0.5%</td>
<td>0.739</td>
</tr>
</tbody>
</table>
Wisconsin ADRC Project 3: 5-year C-TraC RCT

- Single-blind, prospective, randomized controlled trial to determine the effects of C-TraC versus usual care on:
  1. Rehospitalizations at 14, 30 and 90 days
  2. Post-Hospital Delirium, Function, Falls
  3. Caregiver Stress

in patients with dementia discharged from the hospital to the community

✓ Completion: 2020
Goal: Engineer Sustainable Programs for the Most Socioeconomically Disadvantaged Areas
Implementing the Coordinated- Transitional Care (C-TraC) Model in Critical Access Hospitals in Rural Colorado

This material was prepared by Telligen, the Medicare Quality Innovation Network Quality Improvement Organization, under contract with the Centers for Medicare & Medicaid Services (CMS), an agency of the U.S. Department of Health and Human Services. The contents presented do not necessarily reflect CMS policy. 11SOW-CO-SIP1-07/07/17-2180.
Participating Hospitals

- Melissa Memorial Hospital
- Prowers Medical Center
- Rio Grande Hospital & Clinics
- Southeast Colorado Hospital District
- Spanish Peaks Regional Health Center
- Wray Hospital & Clinic
Specific Steps

1. Document existing local discharge processes
2. Provide a comprehensive overview of C-TraC

Pre-Conditions
- Identification of need
- Review existing interventions

Pre-Implementation
- Core elements
- Customize delivery
- Logistics/training

Implementation
- Process evaluation
- Feedback/protocol refinement

1. Convene local multidisciplinary key-stakeholder group
2. Coach local key-stakeholders to define local high-impact outcomes, goals
3. Detailed discussion of core C-TraC elements, processes
4. Formally adapt C-TraC operations to accommodate local VA system
5. Ensure integration with (not duplication of) existing processes
6. Train newly hired C-TraC local staff in clinical program delivery, and provide on-going coaching of program leadership in program assessment, reporting and administrative barrier reduction

1. Coach local C-TraC staff to ensure they achieve widespread local stakeholder engagement prior to launch
2. Coach local C-TraC leadership through iterative phased protocol refinement post-launch
3. Mentor local teams to perform continuous process monitoring, documentation
4. Mentor local C-TraC teams to perform key outcome monitoring and reporting to ensure strongest chances of post-grant sustainability

Maintenance and Evolution
- Sustain
- Disseminate

1. Mentor local C-TraC teams in final results feedback to health system leadership and stakeholders
2. Achieve local C-TraC program sustainment

* Adapted from CDC’s Replicating Effective Programs Implementation Theory Model

* Kind et al, JAGS, 2016
30-Day Readmission Rates

C-TraC Participants: 9.5%*

versus

Non-C-TraC Patients: 14.3%*
Medicare-funded 2-year C-TraC Pilot

- Consideration for additional spread
- Initial findings promising for local sustainability (report):

  ”…CEO confirmed decreased ER visits, increased clinic visits, and a potential increase in HCAPS scores, which they attribute to C-TraC…”
How Can We Meaningfully Improve Health in Disadvantaged Contexts?

(Credit: AP/Robert F. Bukaty)
Neighborhood Disadvantage by ADI
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VACO Leadership
Madison VA C-TraC Team
Kind-team
Bendlin-team
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