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Depression, Cognition, & Social Determinants of Health: Assessing Associations in Older African Americans with Diabetes

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Background

- Social determinants of health have been widely identified as characteristics of one's social and economic climate that affect one's health outcomes¹. (see Graphic 1)
- The Alzheimer's Association indicates that rates of Alzheimer's disease (AD) and other forms of dementia are two times higher in older African Americans than their white counterparts². People who have diabetes are also at an increased risk.
- The prevalence and co-morbidity of depression among older Americans with diabetes (both with and without cognitive impairment) has been well established³.
- Understanding the effect that social determinants of health have on the onset and progression of dementia and depression in older African American diabetics is important as such an understanding may better inform future health policy and government spending on healthcare intervention(s).



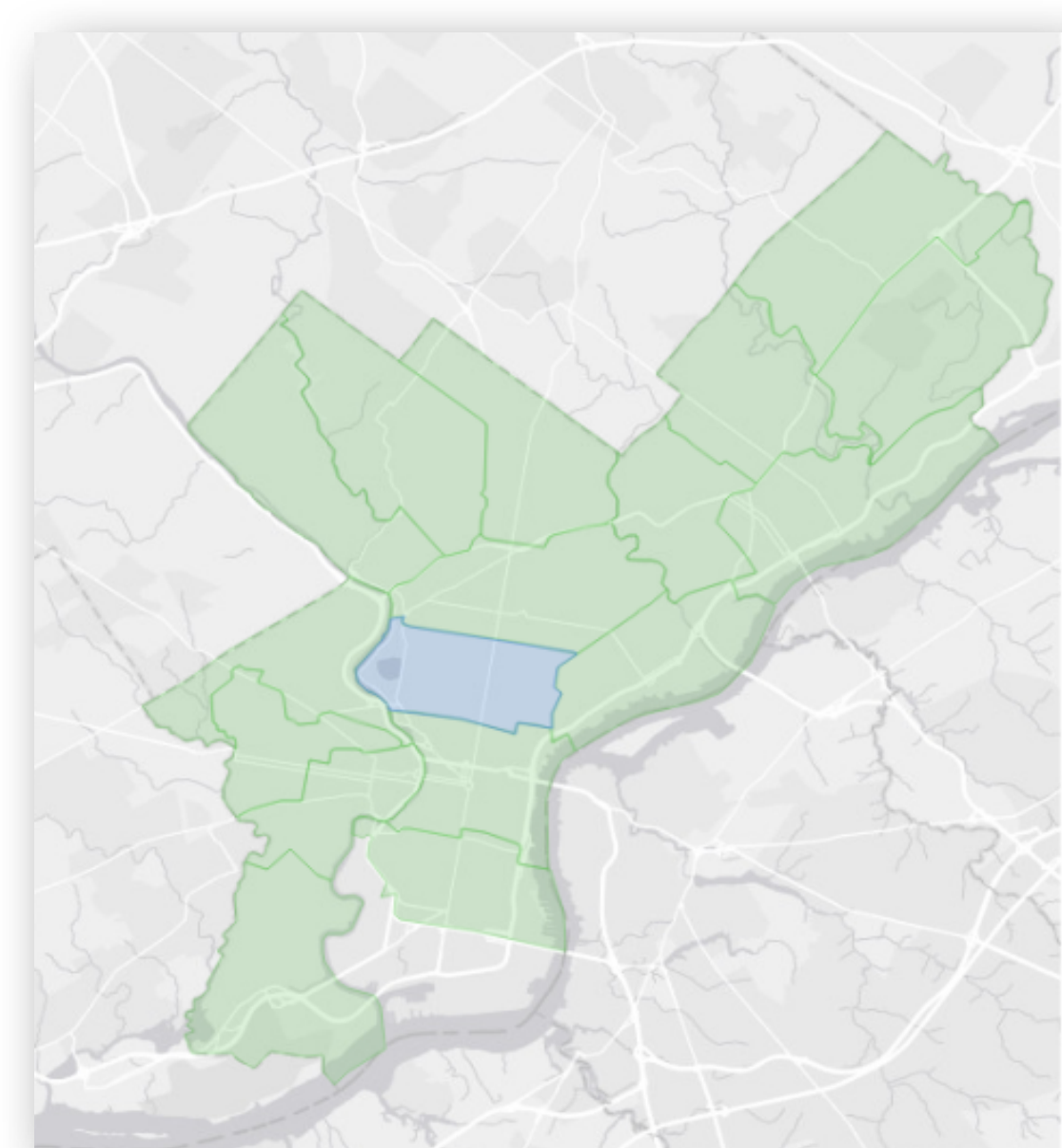
Graphic 1. Social Determinants of Health per Healthy People 2020

Objective

- To assess whether mild cognitive impairment (MCI) and rates of depression are associated with social determinants of health in a population of older (≥65) diabetic African Americans.

Methods

- The sample under study included 141 African American Philadelphians, aged 65 or older with type II diabetes.
- Each subject was administered six neuropsychological exams and a depression questionnaire by trained community health workers.
 - Tests included: Folstein Mini Mental Status Exam (MMSE), Logical Memory test and Logical Memory test delayed, Trail Marking Test, Digit Symbol Substitution Test (DSST), Wide-Range Achievement Test (WRAT-4), and the Depression Patient Health Questionnaire (PHQ-9)
- Using subjects' mailing addresses, subjects were grouped by neighborhood planning district (defined by the City of Philadelphia's Department of Public Health) and values were assigned for neighborhood characteristics using publicly available data. (see Graphic 2 and Table 1)
- Each social determinant of health measure was dichotomized based on a median split.
- A series of one-way ANOVAs were performed to examine differences in cognitive test scores and depression based on neighborhood status (i.e., high or low on each social determinant).



Graphic 2. Planning Districts per City of Philadelphia Community Health Explorer

Planning District	N	Descriptive (Mean) Statistics				
		Unemployment Rate	Poverty	Homicide Mortality	Firearm Homicide	Rat Complaints
UPPER FAR NORTHWEST	2	8.8	11.9	1.5	1.5	3.3
LOWER FAR NORTHWEST	1	11.0	9.7	2.8	2.8	8.7
CENTRAL NORTHWEST	2	12.2	15.5	3.6	1.2	7.6
NORTH DELAWARE LOWER NORTHWEST	2	16.9	18.6	9.7	6.5	19.8
NORTH DELAWARE NORTHWEST	1	18.7	30.0	20.1	17.0	12.8
RIVER WARDS NORTHWEST	1	19.4	32.0	25.2	20.8	39.5
NORTH DELAWARE NORTH	13	24.7	46.3	36.4	30.1	42.0
UPPER NORTH DELAWARE	24	19.7	25.0	14.7	12.8	9.0
LOWER NORTH DELAWARE	22	20.8	46.0	37.2	35.0	28.3
UPPER NORTHWEST	15	14.5	23.0	18.6	17.5	11.4
LOWER NORTHWEST	2	7.5	14.2	0.0	0.0	7.7
WEST PARK	5	13.4	27.9	22.5	18.0	9.2
WEST	16	20.2	34.4	32.9	29.2	11.7
UNIVERSITY SOUTHWEST	4	13.2	40.2	18.5	13.6	7.8
CENTRAL SOUTH	11	6.3	14.6	3.4	4.2	13.0
SOUTH DELAWARE	16	14.1	23.5	9.5	8.8	24.9
LOWER SOUTHWEST	4	17.7	29.0	31.8	31.8	12.7
Total	141	17.15	30.17	21.49	19.26	18.09

Table 1. This table is a graphic representation of data obtained from Philadelphia's Community Health Explorer site.

TEST NUMBER	CORRECT OF 30	MEAN	SD	95% Confidence Interval	Sig. determined by		Sig.
					Lower Bound	Upper Bound	
MMSE	11.7	24.9516	3.73238	0.47854	23.9987	25.9045	0.042
MMSE	11.7	26.0733	2.73885	0.30620	25.4622	26.6897	0.045
MMSE	11.7	25.5816	3.26049	0.27438	25.0387	26.1244	0.046
MMSE	11.7	25.0286	3.03849	0.42293	24.1948	25.8722	0.048
MMSE	11.7	26.1288	2.88310	0.34216	25.4443	26.8092	0.049
MMSE	11.7	25.5816	3.26049	0.27438	25.0387	26.1244	0.050
MMSE	11.7	27.4071	3.47305	1.15389	63.1574	79.7439	0.054
MMSE	11.7	26.9428	2.64653	0.16324	26.5234	27.3522	0.055
MMSE	11.7	27.0000	2.74094	0.88902	25.2319	28.7681	0.056
MMSE	11.7	25.1714	2.95680	0.64205	23.9020	26.4409	0.057

Table 2. This table shows results of one-way ANOVA on cognitive test scores.

DEPRESSION SCORE	POVERTY	N	Mean	SD	Sig. Error	95% Confidence Interval		Minimum	Maximum	Sig. determined by
						Lower Bound	Upper Bound			
DEPRESSION SCORE	POVERTY	66	6.4354	5.89782	0.70136	5.0387	7.8401	0.00	23.00	0.046
DEPRESSION SCORE	POVERTY	75	8.5200	6.48568	0.74900	7.0276	10.0122	0.00	27.00	0.009
DEPRESSION SCORE	POVERTY	141	7.5461	6.19617	0.52181	6.5144	8.5777	0.00	27.00	0.007

Table 3. This table shows results of one-way ANOVA on depression scores

Results

- Results indicate that global cognition [Mini Mental State Exam (MMSE) scores] is related to objective characteristics of living environment, namely homicide rates (p=0.042), rat infestation (p=0.045), and neighborhood poverty (p=0.053). (see Table 2)
- The results also showed that subjects who lived in neighborhoods with higher homicide (p=0.009), firearm homicide (p=0.007), and poverty (p=0.046) rates had lower mean scores on the PHQ-9. (see Table 3)
- One-way ANOVA was performed with planning districts containing at least 8% of the total subject population showed that geographical characteristics accounted for variance in subjects' Logical Memory test and Trail Marking Test (p-values of 0.036 and 0.032 respectively). (*Not shown)
- No statistically significant associations were made between unemployment and subjects' scores on neuropsychological tests or the depression questionnaire.

Study Limitations

- The presence of both counter-intuitive and contradictory one-way ANOVA results for depression may be considered statistical artifact due to volunteer bias and/or cultural (e.g. social and community support) and geographical variance between planning districts: factors which were not accounted for in this study.
- Another consideration for improvement of this study is to incorporate subjective measures of social determinants of health.
- Last, unemployment as an objective measure for economic stability was ineffective, as the statistic used was not representative of individual subjects' job status but that of the community they occupy.

Implications

- Findings from this study show that an association exists between global cognition and social determinants of health in a population of older (≥65) diabetic African Americans.
- Though exploration of a causal relationship is warranted, this finding supports the notion that public health intervention at the community level (e.g. community enrichment and safety improvement) may be an effective measure for the reduction of disparities in diabetes-related MCI.
- Further investigation with the intent of identifying how social determinants of health contribute to the aforementioned health disparities should invoke a study design that addresses the limitations noted in this study.

Acknowledgements

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