A Syndemic View of Cancer Health Disparities in Puerto Rico: The impact on quality of life and cancer health outcomes

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Presentation Objective

• Briefly discuss the Syndemic Framework and how it may contribute to the undestanding of cancer health disparities in Puerto Rico.







- 1. Involves the clustering of two or more diseases within a population
- 2. Contextual and social factors create the conditions in which two (or more) diseases or health conditions cluster
- 3. The clustering of diseases results in adverse disease interaction, either biological or social or behavioral, increasing the health burden of affected populations.

Figure: Model of a syndemic

Syndemics and the biosocial conception of health. Singer, Merrill et al. The Lancet, Volume 389, Issue 10072, 941 - 950



Puerto Rico's Drivers of Contextual and Social Adverse Events

- Economic Recession since 2007 (16 years)
 - Government debt accruing to \$70 billion
 - Massive job losses
 - Before and and after H. Maria, massive migration to the US, especially middle class, educated, skilled and younger residents (25-44 y/o) and children. In the last 10 years, population declined 11.8%.

Roman J. The Puerto Rico Healthcare Crisis. Ann Am Thorac Soc. 2015 Dec;12(12):1760-3. doi: 10.1513/AnnalsATS.201508-531PS. PMID: 26551268.

- Fragile Health Care System
 - Mass migration of healthcare specialists from PR to the continental US
 - Challenges in coordinated care, difficulty receiving referrals and long wait times
 - Aging of population and higher incidence of chronic conditions

Purtle J, Rivera-González AC, Mercado DL, Barajas CB, Chavez L, Canino G, Ortega AN. Growing inequities in mental health crisis services offered to indigent patients in Puerto Rico versus the US states before and after Hurricanes Maria and Irma. Health Serv Res. 2022 Oct 31. doi: 10.1111/1475-6773.14092. Epub ahead of print. PMID: 36310433.





Puerto Rico's Drivers of Contextual and Social Adverse Events



Key Data to Consider

- Economic Crisis and Health
 - In Greece, a meta-analysis found that crisis-driven deterioration of public health led to increasing rates of mental health disorders, suicides, epidemics and deterioration of self-reported health (simow and Koutsogeorgou; 2014)
- Natural Disaster and Health
 - Socially vulnerable communities that have experienced a natural disaster are more likely to have a higher incidence of poor mental and physical health, higher blood pressure and asthma. The incidence of these poor health outcomes increased 1-2% each additional year the community is exposed to a disaster. (Large data set of 500 cities study published by Hahn, Van Wyck, Lessard and Fried, 2021)



Projects Supporting the Data to be Presented

- Post-Hurricane Cancer Care: Patients Needs After Hurricane Maria (R21MD013674, U54CA163071/U54CA163068 MPIs-Castro and Jim; Co-I: Armaiz)
- Cancer Patients Exposed to COVID-19 and Earthquakes: the impact on multilevel determinants of health (R21MD013674-S1, MPIs-Castro and Jim; Co-I Armaiz)
- Biopsychosocial Predictors of Tumor-Associated Inflammation (2054MD007579, MPIs-Castro and Armaiz)







Puerto Rico's SEA Events and Social Determinants of Health's Impact on Stress, Cancer Health Outcomes, and Quality of Life





Projects Supporting the Data Presented

- Post-Hurricane Cancer Care: Patients Needs After Hurricane Maria (R21MD013674, U54CA163071/U54CA163068 MPIs-Castro and Jim; Co-I: Armaiz)
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Study Procedure (n=360)





Behavioral and Health Care Barriers: Longitudinal Changes (N=256)





Communication

Impact of seismic activity on access to health care in Hispanic/Latino cancer patients from Puerto Rico

Cristina Peña-Vargas^{1,*}, Yoamy Toro-Morales², Paola Valentin², María López³, Zindie Rodriguez-Castro¹, Ruthmarie Hernandez-Torres⁴, Nelmit Tollinchi-Natali², Normarie Torres-Blasco^{1,2}, Cristina Pereira², Guillermo N. Armaiz-Peña^{1,3}, Heather Jim⁴ and Eida M. Castro-Figueroa^{1,2}.

 Table 2. Regression analysis to determine the relationship between exposure to earthquakes and barriers to health care services (n=51).

Models for barriers to health	R ²	F	В	n	
care		-	2	r	
Exposure	.331	24.23	-3.32	.000	
Protection	.033	1.515	820	.224	

Table 3. Correlation analysis to evaluate the relationship between barriers to care, exposure, and protection (n=51).

¥7	М	SD.	Variables	
v ariables		SD	Exposure	Protection
1. Exposure to seismic activity	2.55	2.78	-	-
2. Protection during and after seismic activity	3.53	3.39	-	-
3. Total barriers to health care	88.94	16.05	575**	173
4. Skills subscale	91.98	16.25	620**	140
5. Marginalization subscale	91.45	17.80	410**	218
6. Expectation subscale	89.23	20.55	370*	155
7. Knowledge and beliefs subscale	92.21	15.10	519**	135
8. Pragmatics subscale	82.58	19.94	600**	094
****** 0 01				

***p*<0.01.



Cancer Patients and Survivors Behavioral Changes during COVID-19

(N=118)

After the COVID-19 lockdown/curfew did you experience changes in the following behaviors or practices?	Yes	No	More	Less
Sleeping	42(35.6%)	75(63.6%)	15(36%)	26(64%)
Eating a healthy, well-balanced diet	36(30.5%)	81(68.6%)	18(50%)	18(50%)
Physical activity	55(46.6%)	62(52.5%)	19(35%)	36(65%)
Smoking	2(1.7%)	114(96.6%)	2(100%)	-
Alcohol consumption	6(5.1%)	111(94.1%)	3(50%)	3(50%)
Binge watching TV	41(34.7%)	76(64.4%)	37(90%)	3(10%)
Use of social media	<u>53(44.9%)</u>	64(64.2%)	46(87%)	6(13%)
Being sedentary	55(46.6%)	62(52.5%)	31(56%)	24(44%)
Worrying about when you could get more food	26(22%)	91(77.1%)	26(100%)	-



Projects Supporting the Data Presented

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The central hypothesis: Exposure to social-environmental adversity [*exposure to abuse, natural disasters, violence, etc.*] exacerbates the biopsychosocial stress response [*psychological and physiological stress*] to current stressors [*cancer experience*] leading to depression symptoms and contributing to breast tumor microenvironment-associated inflammatory processes.

Study Procedure (n=175)

Screening Inclusion Criteria:

- Adult Hispanic female
- BC patients <5 Y. since Dx.
- Stages 1-III
- Have had surgery for breast tumor removal

Baseline Bio-Behavioral Data Collection

- Behavioral assessments
- Tumor sample (Puerto Rico Biobank)
- Blood samples

F/up Assessments (3, 6, 12 months)

- Behavioral assessments
- Blood sample



Specific Aims:

- Investigate whether current depression symptoms (baseline) or past history of depression and exposure to social-environmental adversity correlate with tumor-associated inflammatory processes in BC tumor microenvironment in H/L women.
- 2. Map the 12-month trajectory of circulatory cytokines and myeloid/lymphoid-derived cells and examine its longitudinal relationship with depression symptoms controlling for hypothesized mediating factors (exposure to traumatic adverse events) and moderating factors (perceived stress, anxiety, resilience, post-traumatic growth, and social support).
- 3. Define the contribution of pre-cancer stress to stressinduced breast cancer progression and explore its effect on immune inflammatory markers in orthotopic animal models of disease.





History of Lifetime Trauma

Exposure to Crime: 45.8% (n=54)

- 0 events: 54.2% (n=64)
- 1 event: 28% (n=33)
- 2 events: 11% (n=13)
- 3 events: 6.8% (n=8)

General Disaster: 100% (n=118)

- 1 event: 5.1% (n=6)
- 2 events: 16.1% (n=19)
- 3 events: 11% (n=13)
- 4 or more events: 67.8 (n=80)

Physical/Sexual Abuse: 37.3% (n=44)

- 0 events: 62.7% (n=74)
- 1 event: 19.5% (n=23)
- 2 events: 8.5% (n=10)
- 3 events: 6.8% (n=8)
- 4 or more: 2.5 (n=3)



Adverse Childhood Events





Symptoms of Depression and Anxiety

Depression Symptoms	Frequency (%) n=127	Anxiety Symptoms	Frequency (%) n=127
Yes	52 (40.9%)	Yes	42 (33.1%)
No	75 (59.1%)	No	85 (66.9%)

Compared to 20% depression and 10% anxiety symptoms

(meta-analysis by Pitman, Suleman, Hyde, Hodgkiss, 2018)

Unpublished data



Adverse Childhood Events as Predictor of Baseline Anxiety and Depression Symptoms

Regression Model (n=118)	R ²	F	Sig
Depression and Childhood adverse events	.170	24.028	<.001
Anxiety and Childhood adverse events	.144	19.668	<.001

Syndemic interaction

The co-occurrence of social and health conditions, including social– psychological, social–biological, and psychological–biological interactions, which worsen the condition of the person or population afflicted.





MDPI

Article

Depression, Anxiety, and Social Environmental Adversity as Potential Modulators of the Immune Tumor Microenvironment in Breast Cancer Patients

Eida M. Castro-Figueroa ^{1,2,*}, Karina I. Acevedo ¹, Cristina I. Peña-Vargas ^{1,2}, Normarie Torres-Blasco ^{1,2}, Idhaliz Flores ^{3,4}, Claudia B. Colón-Echevarria ⁵, Lizette Maldonado ⁶, Zindie Rodríguez ⁶, Alexandra N. Aquino-Acevedo ⁵, Heather Jim ⁷, María I. Lazaro ¹ and Guillermo N. Armaiz-Peña ^{3,5,6}

- Increased tumor-infiltrating B cells were significantly correlated with exposure to crime, anxiety symptoms, and exposure to an adverse childhood events (ACE).
- The ACE plus anxiety group presented the highest infiltration of B cells, T cells, and macrophages

Syndemic interaction



Figure 2. *Macrophage, T cell and B cell expression in patients with psychological distress.* Tumor samples from breast cancer patients were quantified for Macrophage (CD68), B cells (CD19) and T cells (CD3) and divided into groups a) Elevated ACE and history of depression, b) Elevated ACE and GAD7, c) Elevated PHQ8 and Elevated ACE.



Syndemic framework applied to cancer health disparities in Puerto Rico



Recommendations

CANCER CARE FOR THE WHOLE PATIENT



Cancer Care for the Whole Patient: Meeting Psychosocial Health Needs (Institute of Medicine, 2008)

- 1. Identify cancer patients' and survivors' psychosocial care needs.
- 2. Refer and navigate cancer patients and survivors to appropriate psychosocial care.
- 3. Provide psychosocial support for symptom management
- 4. Provide coordinated psychosocial and medical care
- 5. Assess effectiveness of psychosocial services provided.



Cancer Distress Screening



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