

# **DRR: LabCom - Summaries of Articles Found**

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## **1. Youth Developments**

### **The effect of minority status and social context on the development of depression and anxiety: a longitudinal study of Puerto Rican descent youth**

Alegria, M., Shrout, P. E., Canino, G., Alvarez, K., Wang, Y., Bird, H., ... & Duarte, C. (2019).

The effect of minority status and social context on the development of depression and anxiety: a longitudinal study of Puerto Rican descent youth. *World Psychiatry*, 18(3), 298-307.

<https://doi.org/10.1002/wps.20671>

- Keywords used to find the article: Puerto Rico, youth

- 2 - 3 sentence summary: In this study, the researchers explored how minority status affects four developmental mental health outcomes in Puerto Rican youth living on the island and in South Bronx, New York. The researchers examined different models of risk for major depressive disorder (MDD) and generalized anxiety disorder (GAD), depressive and anxiety symptoms (DAS), and psychological distress.
- Outcomes: The outcomes of this study highlight that “interventions at the neighborhood context rather than at the individual level might be important levers to reduce risks for the development of mood disorders in minority youth.”
- Description of the type of study: quasi-experimental, longitudinal

### **Community youth development service-learning: trauma-informed and culturally responsive**

Monte Verde, P., Watkins, M., Enriquez, D., Nater, S., & Harris, J. C. (2019). Community youth development service-learning: trauma-informed and culturally responsive. *Journal of Youth Development*, 14(2). <https://dx.doi.org/10.2139/ssrn.3459805>

- Keywords used to find the article: Puerto Rico, youth
- 2 - 3 sentence summary: As the demographics of the United States change, it is important for youth workers to be able to adapt. Most established forms of youth services model the norms and values of the dominant Western culture. To best engage with a complete spectrum of youth it is vital to take their backgrounds into account; this means being trauma-informed, culturally responsive, and mindful of serving the whole community, and this article covers this topic.
- Outcomes: This article demonstrates how these salient frameworks informed a partnership between service-learning university students and Puerto Rican youth who were displaced by Hurricane Maria in 2017.
- Description of the type of study: service-learning paper, descriptive

### **Population Decline And School Closure in Puerto Rico**

Hinojosa, J., Meléndez, E., & Severino Pietri, K. (2019). Population decline and school closure in Puerto Rico. Center for Puerto Rican Studies at Hunter College: New York, NY, USA. <https://centropr.hunter.cuny.edu/research/data-center/research-briefs/population-decline-and-school-closure-puerto-rico>

- Keywords used to find the article: Puerto Rico, youth
- 2 - 3 sentence summary: This report highlights the population decline that is happening in Puerto Rico and the effects of this decline, such as school closures, the increase of homes being left vacant, and lower growth rates in the child population. It also covers how Hurricane Maria has affected the island and shifted Puerto Rico’s demographic structure. This report has useful statistics for Puerto Rican schools and population changes.
- Outcomes: The population in Puerto Rico is declining, and schools are being closed because of it.
- Description of the type of study: report

### **Understanding Suicidal Ideation in Latino/a Adolescents Living in Puerto Rico**

Duarté-Vélez, Y., Jones, R. N., & Spirito, A. (2018). Understanding suicidal ideation in Latino/a adolescents living in Puerto Rico. *Archives of Suicide Research*, 22(4), 569-583.

<https://doi.org/10.1080/13811118.2017.1378142>

- Keywords used to find the article: Puerto Rico, self-esteem, youth
- 2 - 3 sentence summary: Researchers created and tested a socio-cognitive vulnerability model of suicidal ideation for Puerto Rican adolescents. Overall, the model explained a large amount of the variance in suicidal ideation ( $r^2 = .59$  for females and  $r^2 = .48$  for males). Depressive symptoms had the strongest total effect on suicidal ideation for both sexes ( $r = .69$  for females and  $r = .53$  for males) and negative life events were the most salient socio-environmental factor.
- Outcomes: Results support the mediating role of vulnerability factors and the differential importance of socio-environmental and vulnerability factors in understanding suicidal ideation among Puerto Rican adolescents.
- Description of the type of study: Multiple group path analyses were performed to assess the effect of self-reported socio-environmental and vulnerability factors on suicidal ideation, by sex, in 233 students from the metropolitan area of San Juan, Puerto Rico.

### **Disaster Exposure and Mental Health Among Puerto Rican Youths After Hurricane Maria**

Orengo-Aguayo, R., Stewart, R. W., de Arellano, M. A., Suárez-Kindy, J. L., & Young, J. (2019). Disaster exposure and mental health among Puerto Rican youths after Hurricane Maria. *JAMA network open*, 2(4), e192619-e192619. <https://doi.org/10.1001/jamanetworkopen.2019.2619>

- Keywords used to find the article: Puerto Rico, youth, Hurricane Maria
- 2 - 3 sentence summary: In this study, the researchers sent out a school-based survey to every public school in Puerto Rico between February 1 and June 29, 2018 to determine the magnitude of disaster exposure and mental health outcomes among Puerto Rican youths after Hurricane Maria. Participants were assessed for exposure to hurricane-related stressors, posttraumatic stress disorder (PTSD), and depressive symptoms. The researchers found that Puerto Rican youths experienced significant disaster exposure and reported trauma-related symptoms that warrant evidence-based mental health services.
- Outcomes: Survey results indicate that Hurricane Maria exposed Puerto Rican youths to high levels of disaster-related stressors, and youths reported high levels of PTSD and depressive symptoms. Results are currently being used by the Puerto Rico Department of Education to inform targeted and sustainable evidence-based practices aimed at improving mental health outcomes for Puerto Rico's youths.
- Description of the type of study: survey

### **Exploring the Meanings of Place Attachment Among Civically Engaged Puerto Rican Youth**

Estrella, M. L., & Kelley, M. A. (2017). Exploring the meanings of place attachment among civically engaged Puerto Rican youth. *Journal of community practice*, 25(3-4), 408-431.

<https://doi.org/10.1080/10705422.2017.1347844>

- Keywords used to find the article: Puerto Rican youth

- 2 - 3 sentence summary: Although research has shown that place attachment may promote socially responsible behaviors, it has not been studied from the perspective of youth civic engagement. This study explored the meanings of community-based place attachment among civically-engaged Puerto Rican youth within an ethnic enclave. Photovoice methods were employed using a phenomenological design to enhance our understanding of the participants' lived experiences.
- Outcomes: Findings suggest that community-based place attachment was characterized as multidimensional, identity-affirming, and embedded in participants' narratives about personal involvement in local engagement. Implications for initiatives that actively engage youth in community change efforts and future research are presented.
- Description of the type of study: photovoice sessions

### **Extracurricular Activities and Disadvantaged Youth: A Complicated—But Promising—Story**

Heath, R. D., Anderson, C., Turner, A. C., & Payne, C. M. (2018). Extracurricular activities and disadvantaged youth: A complicated—but promising—story. *Urban Education*, 0042085918805797. <https://doi.org/10.1177%2F0042085918805797>

- Keywords used to find the article: benefits STEM extracurriculars
- 2 - 3 sentence summary: This article reviews research on disadvantaged youth in extracurricular programs, including differences by gender, socioeconomic status, race/ethnicity, and immigrant status.
- Outcomes: Although disadvantaged youth are less likely to participate in extracurricular activities, they often experience greater benefits, depending on the risk status and activity type. Evidence clearly supports expanding access to extracurricular programs for disadvantaged youth.
- Description of the type of study: review

### **Organized Extracurricular Activities: Are In-School and Out-of-School Activities Associated With Different Outcomes for Canadian Youth?**

Guèvremont, A., Findlay, L., & Kohen, D. (2014). Organized extracurricular activities: are in-school and out-of-school activities associated with different outcomes for Canadian youth?. *Journal of School Health*, 84(5), 317-325. <https://doi.org/10.1111/josh.12154>

- Keywords used to find the article: extracurricular youth activities
- 2 - 3 sentence summary: This study examines in-school and out-of-school extracurricular activities for 14- to 17-year-olds using a population-based sample of Canadian youth. Associations with socioemotional and academic outcomes, and having tried smoking, alcohol, and marijuana were examined.
- Outcomes: Weekly participation in both in-school and out-of-school activities were associated with positive and negative outcomes. In particular, youth who participated in out-of-school activities or in both in-school and out-of-school activities had better socioemotional outcomes.
- Description of the type of study: survey

### **Youth-focused citizen science: Examining the role of environmental science learning and agency for conservation**

Ballard, H. L., Dixon, C. G., & Harris, E. M. (2017). Youth-focused citizen science: Examining the role of environmental science learning and agency for conservation. *Biological Conservation*, 208, 65-75. <https://doi.org/10.1016/j.biocon.2016.05.024>

- Keywords used to find the article: science youth activities
- 2 - 3 sentence summary:
- Outcomes: Youth developed ecological knowledge, expertise, and capacity to take action. Youth CCS contributed data to coastal area management and stream restoration.
- Description of the type of study: Researchers examined two youth-focused community and citizen science (CCS) programs.

### **How do middle school girls of color develop STEM identities? Middle school girls' participation in science activities and identification with STEM careers**

Kang, H., Calabrese Barton, A., Tan, E., D Simpkins, S., Rhee, H. Y., & Turner, C. (2019). How do middle school girls of color develop STEM identities? Middle school girls' participation in science activities and identification with STEM careers. *Science Education*, 103(2), 418-439. <https://doi.org/10.1002/sce.21492>

- Keywords used to find the article: science underrepresented youth activities
- 2 - 3 sentence summary: science youth activities
- Outcomes: Girls' self-perception in relation to science was the strongest predictor of their identification with STEM-related careers, and this self-perception was positively and distinctively associated with their experiences with science at home, outside of school, and in school science classes.
- Description of the type of study: Researchers examined two youth-focused community and citizen science (CCS) programs.

## **2. STEM**

### **Use of Emerging Conductive Materials for K-12 STEAM Outreach Activities and the Impact on Community Education Resilience**

Del Valle-Morales, A., Aponte-Lugo, A., Torres-Rodríguez, J., & Ortiz-Rivera, E. I. (2020, October). Use of Emerging Conductive Materials for K-12 STEAM Outreach Activities and the Impact on Community Education Resilience. In *2020 Resilience Week (RWS)* (pp. 140-146). IEEE. <https://doi.org/10.1109/RWS50334.2020.9241277>

- Keywords used to find the article: teaching STEM, resilience
- 2 - 3 sentence summary: The study shows how emerging conductive materials can be used to develop different projects and activities in the fields of STEAM that could expose students, from an early age to topics like electronics, engineering problem solving, critical and creative thinking, technical skills and teamwork among other things. Resilience factors in relation to STEAM education (Table II). Ideas using conductive dough, copper tape, and paint for new activities and projects.



- Outcomes: During the experiment using the conductive dough, copper tape, and paint, resilience factors were present: relationships, identity, power and control, social justices, access to materials resources, cohesion, and cultural adherence.
- Description of the type of study: Report from a K-12 workshop

### **Developing a Collaborative Undergraduate STEM Program in Resilient and Sustainable Infrastructure**

Lopez del Puerto, C., Cavallin, H., Perdomo, J., Muñoz, J., Suarez, O. M., & Andrade, F. (2019). Developing a Collaborative Undergraduate STEM Program in Resilient and Sustainable Infrastructure. *Review & directory-American Society for Engineering Education*.

<https://par.nsf.gov/biblio/10111782>

- Keywords used to find the article: teaching STEM, resilience
- 2 - 3 sentence summary: In Puerto Rico, the aftermath of Hurricanes Irma and Maria has heightened awareness regarding the education on infrastructure-related disciplines to provide transdisciplinary solutions to pertinent complex challenges. Current public awareness of the vulnerability of the existing infrastructure creates an opportunity to recruit and prepare students to become those much-needed professionals.
- Outcomes: Collaborative effort to train future professionals to design and build a robust infrastructure that can overcome the impact of major natural catastrophes
- Description of the type of study: Implemented in a collaborative platform among three campuses of the University of Puerto Rico System

### **Service-Learning as a Lever to Support STEM Engagement for Underrepresented Youth**

Collins, M. A., Totino, J., Hartry, A., Romero, V. F., Pedroso, R., & Nava, R. (2020).

Service-Learning as a Lever to Support STEM Engagement for Underrepresented Youth.

Journal of Experiential Education, 43(1), 55-70. <https://doi.org/10.1177%2F1053825919887407>

- Keywords used to find the article: youth, STEM, underrepresented
- 2 - 3 sentence summary: Women and people of color are consistently underrepresented in science, technology, engineering, and math (STEM) fields and careers. Though there are myriad factors underlying these gaps, one potential variable may be the extent to which these students feel connected to their STEM classroom experiences. The present study investigated the potential of a service-learning experience to support STEM engagement for underrepresented youth.
- Outcomes: Students were highly engaged in service-learning activities and demonstrated improved Science Fascination, Science Values, and STEM Career Affinity after participating in the program. Implications for the design and delivery of culturally relevant service-learning experiences are discussed.
- Description of the type of study: Two cohorts of high school students participated in a summer program through which they built “solar suitcases” to provide electricity for communities in need. Observations and student surveys measured student engagement and changes in STEM attitudes, dispositions, and beliefs.



### **Benefits of Informal Learning Environments: A Focused Examination of STEM-based Program Environments**

Denson, C., Austin, C., Hailey, C., & Householder, D. (2015). Benefits of informal learning environments: A focused examination of STEM-based program environments. *Journal of STEM Education*, 16(1). <https://eric.ed.gov/?id=EJ1065411>

- Keywords used to find the article: STEM education benefits
- 2 - 3 sentence summary: This paper examines STEM-based informal learning environments for underrepresented students and reports on the aspects of these programs that are beneficial to students. This qualitative study provides a nuanced look into informal learning environments and determines what is unique about these experiences and makes them beneficial for students.
- Outcomes: Results of this study should inform formal learning environments and other informal learning environments as to the components that make these learning environments effective and appealing to underrepresented students populations.
- Description of the type of study: Focus group interviews

### **Science Teaching and Learning Activities and Students' Engagement in Science**

Hampden-Thompson, G., & Bennett, J. (2013). Science teaching and learning activities and students' engagement in science. *International Journal of Science Education*, 35(8), 1325-1343. <https://doi.org/10.1080/09500693.2011.608093>

- Keywords used to find the article: science youth activities
- 2 - 3 sentence summary: The purpose of this analysis is to describe the variation in students' reports of engagement in science across science teaching and learning activities. In addition, this study examines student and school characteristics that may be associated with students' levels of engagement in science.
- Outcomes: The main results indicate that there is an association between students' motivation towards science, enjoyment of science and future orientation towards science, and the frequency in which various teaching and learning activities take place in the classroom. Understanding student engagement in science and the factors that influence it is essential in addressing the issue of uptake of science after compulsory schooling.
- Description of the type of study: Data are drawn from the Programme for International Student Assessment 2006 study. The analysis employs a quantitative approach that includes descriptive and inferential statistics to examine three measures of student engagement for a nationally representative sample of approximately 12,000 15-year-old students in the UK.

## **3. Urban Ecology & Climate Change Adaptation**

### **Climate change, heat, and mortality in the tropical urban area of San Juan, Puerto Rico**

Méndez-Lázaro, P. A., Pérez-Cardona, C. M., Rodríguez, E., Martínez, O., Taboas, M., Bocanegra, A., & Méndez-Tejeda, R. (2018). Climate change, heat, and mortality in the tropical urban area of San Juan, Puerto Rico. *International Journal of Biometeorology*, 62(5), 699–707. <https://doi.org/10.1007/s00484-016-1291-z>

- Keywords used to find the article: Climate change, Extreme weather events, Heat episodes, Mortality, Puerto Rico
- 2 - 3 sentence summary: Evaluates the effects of excessive and prolonged heat episodes between 2009 and 2013 on overall and cause-specific mortality (deaths) in San Juan and Bayamón. “More than 100 years of record for San Juan suggest that the occurrence of prolonged heat episodes is becoming more frequent (PRCCC 2013; Méndez-Lázaro et al. 2014a, b).” “The paved surfaces in urban environments absorb, produce, and retain more heat than surrounding areas and can raise surrounding temperatures.”
- Outcomes: Increase in the effect of “high temperatures on mortality, especially for stroke and cardiovascular diseases during the summers of 2012 and 2013.” 2012 and 2013 are the hottest summers on record in PR
- Description of the type of study: Statistical analysis of “data on non-accidental mortality (records of death occurring in San Juan and Bayamón) and air surface temperature records”

### **Utilising green and bluespace to mitigate urban heat island intensity**

Gunawardena, K. R., Wells, M. J., & Kershaw, T. (2017). Utilising green and bluespace to mitigate urban heat island intensity. *Science of the Total Environment*, 584–585, 1040–1055.

<https://doi.org/10.1016/j.scitotenv.2017.01.158>

- Keywords used to find the article: Urban heat island, Greenspace, Bluespace Evapotranspiration, Green infrastructure, Blue infrastructure
- 2 - 3 sentence summary: Review paper that summarizes and analyzes research on the effect bluespaces and greenspaces have on mitigating the urban heat island (UHI) effect. Discusses how greenspaces positively affect urban environments: “reduced surface runoff, flood relief, sustainable drainage, general aesthetic and wellbeing enhancements and the modification of local micro-climates (CCC, 2014)... can also harbour important biodiversity”
- Outcomes: “Tree-dominated greenspace offers the greatest heat stress relief when it is most needed (... depends on size, spread, and geometry of greenspaces, with some solitary large parks found to offer minimal boundary-layer cooling. Contribution to cooling at the scale of the urban boundary-layer climate is attributed mainly to greenspace increasing surface roughness and thereby improving convection efficiency rather than evaporation.”
- Description of the type of study: Review (meta-analysis) of past studies about how greenspace and bluespace mitigate the urban heat island intensity

### **Quantifying key drivers of climate variability and change for Puerto Rico and the Caribbean**

Hayhoe, K. (2013). Quantifying key drivers of climate variability and change for Puerto Rico and the Caribbean. *Raleigh, North Carolina: Caribbean Landscape Conservation Cooperative*.

[http://www.pr-ccc.org/wp-content/uploads/2014/08/PP\\_1-52\\_Hayhoe\\_Caribbean\\_Final\\_Report.pdf](http://www.pr-ccc.org/wp-content/uploads/2014/08/PP_1-52_Hayhoe_Caribbean_Final_Report.pdf)

- Keywords used to find the article: Climate variability, Puerto Rico, Global Climate Models (GCM)
- 2 - 3 sentence summary: This study determines the large-scale influences on temperature and precipitation in the Caribbean and evaluates whether global climate models can simulate these influences. This study also generates high-resolution projections of maximum temperature, minimum temperature and 24 hr cumulative precipitation.
- Outcomes: PR expected to warm faster than the global average. Rainfall is projected to decrease in the wet season, with more frequent dry days. "Moderate extreme" precipitation is projected to decrease, while more extreme precipitation is expected to become more common.
- Description of the type of study: Simulations from 32 different GCMS generated high-resolution temperature and rainfall predictions

### **Trends in total rainfall, heavy rain events, and number of dry days in San Juan, Puerto Rico, 1955-2009**

Méndez-Lázaro, P. A., Nieves-Santiago, A., & Miranda-Bermúdez, J. (2014). Trends in total rainfall, heavy rain events, and number of dry days in San Juan, Puerto Rico, 1955-2009. *Ecology and Society*, 19(2). <https://doi.org/10.5751/ES-06464-190250>

- Keywords used to find the article: Climate variability, Puerto Rico, Rainfall patterns, San Juan, Trend analysis
- 2 - 3 sentence summary: Statistical analysis of rainfall trends in San Juan, PR from 1955-2009.
- Outcomes: Rainfall trends and variability are complex. Total annual rainfall increased slightly. Dry days decreased and were more common in the winter months. Heavy rains were more common in summer and fall (hurricane season). Most intense rainfall episodes occurred in spring.
- Description of the type of study: Statistical trend analysis (Mann-Kendall trend test) of 4 weather stations

### **Bringing Local Knowledge into Environmental Decision Making Improving Urban Planning for Communities at Risk**

Corbum, Jason. (2003). Bringing Local Knowledge into Environmental Decision Making: Improving Urban Planning for Communities at Risk. *Journal of Planning Education and Research* 22 (4), 420-433. <https://doi.org/10.1177/0739456X03022004008>

- Keywords used to find the article: contextual knowledge, puerto rico, environment
- 2 - 3 sentence summary: The article used interviews, primary texts, and ethnographic fieldwork, to define local knowledge, reveal how it differs from professional knowledge, and argue that local knowledge can improve planning in at least four ways (1) *epistemology*, adding to the knowledge base of environmental policy; (2) *procedural democracy*, including new and previously silenced voices; (3) *effectiveness*, providing low-cost policy solutions; and (4) *distributive justice*, highlighting inequitable distributions of environmental burdens.

- Outcomes: Supports importance of contextual knowledge in relation to public policy (another Lab Com goal)
- Description of the type of study:

### **Asleep at the switch and unsuspecting victims: Exploring flood risk awareness and adaptive capacity in an urban watershed in Puerto Rico**

Santiago-Bartolomei, R., Santiago, L. E., & Melendez-Ackerman, E. (2016). Asleep at the switch and unsuspecting victims: Exploring flood risk awareness and adaptive capacity in an urban watershed in Puerto Rico. *Plerus*, 25, 13–34.

[https://data.fs.usda.gov/research/pubs/iitf/ja\\_iitf\\_2017\\_Santiago.pdf](https://data.fs.usda.gov/research/pubs/iitf/ja_iitf_2017_Santiago.pdf)

- Keywords used to find the article: Adaptive capacity, risk awareness, flooding, climate change, Puerto Rico
- 2 - 3 sentence summary: This study focuses on risk knowledge and awareness that flood-prone communities possess in the Río Piedras watershed. “Another objective is to determine the level of efficiency with which institutions and organizations are conveying information on flood risk to the exposed communities.” Socioeconomic characteristics are considered to “explore awareness gaps and inequities in access to information”
- Outcomes: Current institutional framework does not improve household adaptive capacity for flood hazards in San Juan, Puerto Rico. “We believe a place-based, bottom-up approach is essential in order to involve active participation of all stakeholders”
- Description of the type of study: Exploratory research. Survey residents 1 km radius buffer along watershed – 441 surveys completed, final sub-sample of 116 surveys. Informal interviews with key informants from DNER, PRPB, and PREMA

### **Contributions of Ecosystem Services to Human Well-Being in Puerto Rico**

Yee, S. H. (2020). Contributions of Ecosystem Services to Human Well-Being in Puerto Rico. *Sustainability*, 12(22), 9625. <https://doi.org/10.3390/su12229625>

- Keywords used to find the article: Puerto Rico, extracurricular
- 2 - 3 sentence summary: Ecosystem services, including availability of greenspace, clean air, and clean water, can have benefits to human well-being, but their relative importance compared to economic or social services is often overlooked. This study quantifies and maps neighborhood-scale indicators of human well-being and ecosystem services for Puerto Rico to better understand the degree to which ecosystem services provisioning, alongside co-occurring social and economic services, explains variability in a number of indicators of human well-being.
- Outcomes: The analysis detected that substantial portions of well-being, in particular education and human health, could be explained by variability in ecosystem services over space and time, especially availability of greenspace. Linking ecosystem services to multivariate elements of human well-being can serve to complement more traditional community planning or environmental management efforts by helping identify potential unintended consequences or overlooked benefits of decisions.

- Description of the type of study: Study using the U.S. HWBI framework to model the relationships between economic, social, and ecosystem services and human well-being for Puerto Rico

### **Fostering an Ecological Culture for Puerto Rico**

Lloveras, F. (2019). Fostering an Ecological Culture for Puerto Rico. *Childhood Education*, 95(2), 45-52. <https://doi.org/10.1080/00094056.2019.1593760>

- Keywords used to find the article: Puerto Rico, youth, education
- 2 - 3 sentence summary: This article talks about Para La Naturaleza (PLN), a nature conservation and historical preservation trust in Puerto Rico. It then covers the goals and guidelines of PLN.
- Outcomes: PLN wants to change human behavior through its educational program. Its overarching goals are to: (1) advance sustainability by protecting 33% of Puerto Rico's ecosystems by 2033 (currently at 16%), (2) transform our culture into an ecological one, and (3) constantly enhance our institutional capacity to accomplish the previous two.
- Description of the type of study: Description of PLN

## **4. Social Capital**

### **Social capital and community resilience**

Aldrich, D. P., & Meyer, M. A. (2015). Social capital and community resilience. *American behavioral scientist*, 59(2), 254-269. <https://doi.org/10.1177%2F0002764214550299>

- Keywords used to find the article: social capital, community resilience
- 2 - 3 sentence summary: Instead of preparing only on physical infrastructure and materialistic stuff (i.e., food and water), creating strong ties with neighbors, knowing the key persons in the community, and having experience working together with local NGOs is also important in crisis to supporting vulnerable populations in disaster. It is important to enhance the social cohesion and deepening trust in the communities as the social capital can be generated but also can be degraded. Interventions to increase reservoirs of trust and deepen networks: the practices of time banking and community currency, focus group meetings and social events, and planning of community layout and architectural structures.
- Outcomes: Concrete policy recommendations for disaster managers, government decision makers, and nongovernmental organizations for increasing resilience to catastrophe through strengthening social infrastructure at the community level.
- Description of the type of study: Literature on social capital definition and its application to community resilience before, during, and after disasters, also the ways used to measure social capital. Empirical evidence for the significant role of social capital in disaster response and recovery.

### **The Role of Social Capital in Resiliency: Disaster Recovery in Puerto Rico**

Delilah Roque, A., Pijawka, D., & Wutich, A. (2020). The role of social capital in resiliency: Disaster recovery in Puerto Rico. *Risk, Hazards & Crisis in Public Policy*, 11(2), 204-235. <https://doi.org/10.1002/rhc3.12187>

- Keywords used to find the article: social capital, resilience, puerto rico
- 2 - 3 sentence summary: Explores how barrios (small legal divisions) can use social capital to recover and potentially increase resilience before and after a disaster. The communities' actions pre-and-post-Hurricane María assisted the residents in coping and reducing vulnerability in two rural barrios (small legal divisions)
- Outcomes: social capital facilitated recovery efforts and enhanced resiliency through shared values, network expansion, new partnerships, and a desire to make their communities more robust and less vulnerable to upcoming environmental disturbances.
- Description of the type of study: semi-structured interview with community leaders in Puerto Rico

### **A Conceptual Framework to Enhance Community Resilience Using Social Capital**

Pfefferbaum, B., Van Horn, R. L., & Pfefferbaum, R. L. (2017). A conceptual framework to enhance community resilience using social capital. *Clinical Social Work Journal*, 45(2), 102-110. <https://doi.org/10.1007/s10615-015-0556-z>

- Keywords used to find the article: community resilience, social capital
- 2 - 3 sentence summary: The study provides a conceptual framework for improving community disaster resilience through enhanced social capital. Resilience, both personal and community resilience, is increased by the social capital that emerges from improved social connections and social networks. Effective disaster management relies on social networks to connect and support individuals, families, groups, and organizations within the community and to link the community with the disaster system of care.
- Outcomes: a conceptual framework
- Description of the type of study:

### **Developing social capital through participation in organized youth programs: Qualitative insights from three programs**

Jarrett, R. L., Sullivan, P. J., & Watkins, N. D. (2005). Developing social capital through participation in organized youth programs: Qualitative insights from three programs. *Journal of Community Psychology*, 33(1), 41–55. <https://doi.org/10.1002/jcop.20038>

- Keywords used to find the article: Social capital, After School Programs
- 2 - 3 sentence summary: “Primary objective was to understand youth’s developmental experiences - in this case, social capital formation.” Three programs for high-school-aged youth were studied: (1) Clarkston FFA: A Rural School-Based Program, (2) Art-First: An Urban Arts Program, (3) Youth Action: An Urban Civic Program.
- Outcomes: (1) Three stages of youth-adult relationship formation: suspicion and distrust -> facilitated contact -> meaningful connection. (2) “These relationships provided youth with access to adult resources, such as information, assistance, exposure to adult worlds, support, and encouragement”
- Description of the type of study: Qualitative study of 10-13 youth participants per program. Biweekly phone interviews over 3-4 months.



### **The dynamic process of social capital during recovery from Tropical Storm Irene in Vermont**

Consoer, M., & Milman, A. (2016). The dynamic process of social capital during recovery from Tropical Storm Irene in Vermont. *Natural Hazards*, 84(1), 155-174.

<https://doi.org/10.1007/s11069-016-2412-z>

- Keywords used to find the article: Social capital, Recovery
- 2 - 3 sentence summary: Recovery group formation via bonding and bridging social capital has experienced a proliferating social capital and access to high-value resources. Community with less social capital forms the group via linking social capital. This group has adequate resources for victim recovery and equalized growing inequalities. The organizations or recovery groups fill specific disaster needs unmet through formal governmental assistance programs.
- Outcomes: Linking social capital between the recovery group leaders and the formal disaster framework lead to the creation of valuable resources that enabled recovery groups to continue autonomous efforts tailored to the communities in their jurisdictions.
- Description of the type of study: Qualitative study using 10 recovery groups

### **Social capital and livelihood recovery: post-tsunami Sri Lanka as a case**

Minamoto, Y. (2010). Social capital and livelihood recovery: post-tsunami Sri Lanka as a case. *Disaster Prevention and Management: An International Journal*.

<https://doi.org/10.1108/09653561011091887>

- Keywords used to find the article: Social capital, Recovery
- 2 - 3 sentence summary: The factors which best prescribe people's perceptions of livelihood recovery are formal network in the community, and leadership and trustship of community-based organizations. The negative coefficient for newly established community-based non-governmental organizations (NGOs) after the tsunami assumed a serious aspect of "élite capture", which implies a dark side of collective action with semi-forced participation. Participatory design process in the organizations was another negative factor for livelihood recovery
- Outcomes: Disaster support for livelihood recovery at the community level needs serious consideration about social factors and power structure of the community, and careful design of a participatory approach to reduce the risk of "élite capture".
- Description of the type of study: Survey on 190 households in two divisions of a district. The quantitative analysis design captured the extent to which both cognitive and structural social capital factors prescribe people's overall perceptions of livelihood recovery.

### **Social capital as a vital resource in flood disaster recovery in Malaysia**

Chan, N. W., Roy, R., Lai, C. H., & Tan, M. L. (2018). Social capital as a vital resource in flood disaster recovery in Malaysia. *International Journal of Water Resources Development*.

<https://doi.org/10.1080/07900627.2018.1467312>

- Keywords used to find the article: Social capital, Recovery
- 2 - 3 sentence summary: Social capital builds collaborations and partnerships among disaster organizations, mobilizes the public as disaster volunteers, strengthens



community resilience and deepens family ties. Social capital also builds self-reliance, enhances coping and quickens recovery from floods.

- Outcomes: Formulation and implementation of flood policies and strategies should include and maximize social capital.
- Description of the type of study: Collecting primary data via surveys and interviews, published secondary data, participatory observations and focus group discussions.

## 5. Citizen Science

### **Participatory Early Warning Systems: Youth, Citizen Science, and Intergenerational Dialogues on Disaster Risk Reduction in Brazil**

Marchezini, V., Trajber, R., Olivato, D. et al. (2017). Participatory Early Warning Systems: Youth, Citizen Science, and Intergenerational Dialogues on Disaster Risk Reduction in Brazil. *Int J Disaster Risk Sci* 8, 390–401. <https://doi.org/10.1007/s13753-017-0150-9>

- Keywords used to find the article: citizen science, youth, environment, puerto rico
- 2 - 3 sentence summary: The article investigates the lack of direction from the United Nations International Strategy for Disaster Reduction (UNISDR) on how to effectively build national people-centered early warning systems (EWS) to both minimize risk and develop a resilient community. UNISDR (and other research) suggests people-centered EWS are more effective at DRR than top-down technological approaches, but there has been little research to support how to develop these systems. This article examines the obstacles and measures required to promote people-centered EWS in a Brazilian high school participatory citizen science project.
- Outcomes: Guidelines are developed for adopting a bottom-up approach towards achieving the four elements of EWS—risk knowledge, monitoring, communication of warnings, and response capability—with the help of school curricula.
- Description of the type of study:

### **Citizen Science a Tool for Community Engagement in Parks with an Urban Dominating Landscapes in Puerto Rico**

Govender, et. al. (2016). Citizen Science a Tool for Community Engagement in Parks with an Urban Dominating Landscapes in Puerto Rico. *Modern Environmental Science and Engineering*, 2 (12). [doi.org/10.15341/mese\(2333-2581\)/12.02.2016/008](https://doi.org/10.15341/mese(2333-2581)/12.02.2016/008)

- Keywords used to find the article: citizen science, environment, Puerto Rico
- 2 - 3 sentence summary: The study analyzes the impact 1300 citizen scientist volunteers had on their communities and ecosystems when they go through the Informal Science Education model of citizen science. It focuses on local participation in urban Natural Protection Areas (NPAs) to increase biodiversity in watersheds, measure water quality, and other environmental activities.
- Outcomes: Emphasizes the importance of local, citizen scientists to protect and conserve biodiversity and ecosystem processes
- Description of the type of study: I would consider it a program evaluation of an effort very similar to Caras, with over 1300 participant “scientists”. While they are not exclusively

youth, the mission statement of the program almost echoes Caras to read, “The main goal is to enable the citizens to develop the skills of scientific inquiry and to address environmental concerns within their community.”

- Reviewer comments (include your name): Ginger (self review)- short and easy to read. Has a lot of “quick facts” about Puerto Rico at the beginning. I think this might have been in the original Excel sheet as a “both” article, but it reemerged in my search for citizen science literature.

### **Citizen science for hydrological risk reduction and resilience building**

Paul, J. D., Buytaert, W., Allen, S., Ballesteros-Cánovas, J. A., Bhusal, J., Cieslik, K., et al. (2018). Citizen science for hydrological risk reduction and resilience building. *WIREs Water*, 5(e1262). <https://doi.org/10.1002/wat2.1262>

- Keywords used to find the article: citizen science, resiliency, hydrological risk (flooding, landsliding)
- 2 - 3 sentence summary: This paper discusses usefulness of citizen science at four varying levels of engagement (1) crowdsourcing, (2) distributed intelligence, (3) participatory science, (4) extreme. Also discusses the benefits of polycentric disaster risk reduction over a monocentric approach. “We believe that the future of citizen science lies not in mere data collection, but rather in its integration with information processing and feedback (i.e., the complete research project life-cycle).”
- Outcomes: “Citizen science could complement more traditional knowledge generation practices, and also enhance innovation, adaptation, multidirectional information provision, risk management, and local resilience building”
- Description of the type of study: Reviews citizen science methodologies in context of hydrological risk. Includes useful table “Recent Examples of citizen Science Applications in Hydrological Risk Reduction and Resilience Building”

### **Participatory action research: tools for disaster resilience education**

Meyer, M. A., Hendricks, M., Newman, G. D., Masterson, J. H., Cooper, J. T., Sansom, G., ... & Cousins, T. (2018). Participatory action research: Tools for disaster resilience education. *International journal of disaster resilience in the built environment*.

<https://doi.org/10.1108/IJDRBE-02-2017-0015>

- Keywords used to find the article: STEM, resilience, education
- 2 - 3 sentence summary: Participatory action research can improve scientific knowledge and community capacity to address disaster resilience and environmental justice. Risk assessment and urban planning processes still frequently operate within expertise-driven groups without significant community engagement. Such fragmentation results in part from a lack of appreciation for community expertise in built environment adaptations and educational tools to support resident involvement in the often technical built environment planning processes. Approach: A participatory research and place-based education project was developed that enhanced co-learning between residents and researchers while collecting and analyzing local data on flood resilience in the built environment. Partners included high school and college students, residents and environmental justice organizations

- Outcomes: participatory research positively contributed to resilience knowledge of participants.
- Description of the type of study: Case study

### **Downscaling a human well-being index for environmental management and environmental justice applications in Puerto Rico**

Yee, S. H., Paulukonis, E., & Buck, K. D. (2020). Downscaling a human well-being index for environmental management and environmental justice applications in Puerto Rico. *Applied Geography*, 123, 102231. <https://doi.org/10.1016/j.apgeog.2020.102231>

- Keywords used to find the article: Puerto Rico, youth, education
- 2 - 3 sentence summary: Para la Naturaleza (PLN), a nature conservation and historical preservation trust in Puerto Rico, started its educational programming in 1980 as a basic survival strategy. At that point in time, many considered land conservation to be a waste of time and resources, viewing the protection of marshes, mangroves, coastal and dry forests, and other ecosystems as impediments to the much-needed economic development. Restoring historical sites within the protected areas gave us the opportunity to establish visitors' centers for our recently inaugurated interpretation program and opened up a great opportunity that eventually evolved into a symbiotic relationship between natural and historical heritage education.
- Outcomes: PLN wants to change human behavior through its educational program. Our overarching goals are to: (1) advance sustainability by protecting 33% of Puerto Rico's ecosystems by 2033 (currently at 16%), (2) transform our culture into an ecological one, and (3) constantly enhance our institutional capacity to accomplish the previous two.
- Description of the type of study:

### **Citizen Disaster Science Education for effective disaster risk reduction in developing countries**

Parajuli, R. R. (2020). Citizen Disaster Science Education for effective disaster risk reduction in developing countries. *Geoenvironmental Disasters*, 7(1), 1–4. <https://doi.org/10.1186/s40677-020-00150-2>

- Keywords used to find the article: Citizen science; Community participation; Disaster risk reduction (DRR); Sustainable development goals
- 2 - 3 sentence summary: This paper discusses several frameworks that can help developing countries get closer to the The Sustainable Development Goals (SDG for 2030) set by the United Nations (United Nations 2019a, citation within paper). Figure within the paper “shows a summary of the major engagement and components that must be considered on an individual, community and institutional level for Disaster Risk Reduction (DRR).” Major components of DRR are risk assessment, preparedness and awareness.
- Outcomes: “Citizen Disaster Science Education (CDSE) could be an effective way to enhance disaster education in developing countries.”
- Description of the type of study: Summary of DRR in several developing countries while arguing CDSE could improve DRR

### **A review on citizen science (CitSci) applications for disaster management**

Kocaman, S., Anbaroglu, B., Gokceoglu, C., & Altan, O. (2018). A review on citizen science (CitSci) applications for disaster management. *International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 42, 301–306.

<https://doi.org/10.5194/isprs-archives-XLII-3-W4-301-2018>

- Keywords used to find the article: Citizen Science, Disaster management, Sustainability
- 2 - 3 sentence summary: Literature review of methods and applications of Citizen Science in different phases of disaster management. Application examples: capacity building, early-warning (pre-disaster); data collection and validation, aid provision (during-disaster); damage assessment, long-term effect monitoring (post-disaster)
- Outcomes: “To minimize the loss of lives, all stakeholders should consider effective ways in which to utilize CitSci. The better the use of local knowledge in a disaster struck area, the better the aid is delivered.”
- Description of the type of study: Review of different ways Citizen Science can aid disaster management

## **6. Program Evaluation**

### **Knowledge Gain and Behavioral Change in Citizen-Science Programs**

Jordan, R. C., Gray, S. A., Howe, D. V., Brooks, W. R., & Ehrenfeld, J. G. (2011). Knowledge Gain and Behavioral Change in Citizen-Science Programs. *Conservation Biology*, 25(6), 1148–1154. <https://doi.org/10.1111/j.1523-1739.2011.01745.x>

- Keywords used to find the article: Citizen Science, Resilience
- 2 - 3 sentence summary: The link between citizen and “professional” science is not well established, as a consequence there are no guidelines for collaboration between participants in such initiatives and Scientists. A study carried out by the authors showed that the program increased participants’ knowledge of the topic (invasive plants) and their awareness, but not their understanding of how scientific research is conducted, also their behavior towards invasive plants did not change.
- Outcomes: Conservation programs increased interest and awareness but the lack of a systematic approach leads to a lot of heterogeneity in individual outcomes. There are clear gains in content knowledge, but limited gains in understanding the nature of science and its procedural aspects.
- Description of the type of study: 93 volunteers recruited through the New York-New Jersey trail conference, who attended two training sessions of 8 and 4 hours each on identification of invasive plants.

### **Where to plant urban trees? A spatially explicit methodology to explore ecosystem service tradeoffs**

Bodnaruk, E. W., Kroll, C. N., Yang, Y., Hirabayashi, S., Nowak, D. J., & Endreny, T. A. (2017). Where to plant urban trees? A spatially explicit methodology to explore ecosystem service tradeoffs. *Landscape and Urban Planning*, 157, 457–467.

<https://doi.org/10.1016/j.landurbplan.2016.08.016>

- Keywords used to find the article: urban ecology

- 2 - 3 sentence summary: Urban tree development helps mitigate the impacts of air pollution and heat island effects, due to increased evapotranspiration and thermal emissivity. Five planting scenarios were analyzed and the authors show how the tree-planting order is important due to the time length of tree-planting programs.
- Outcomes: Ecosystem services and benefits were quantified for the five planting scenarios and compared to services and benefits provided by Baltimore's current tree cover (24%) and potential maximum tree cover (44.4%). Pollution removal across scenarios ranged from 133 to 139 t/yr and monetary benefits ranged from \$4.3 M to \$6.2 M.
- Description of the type of study: Simulations carried out using i-Tree database estimations.

### **Urban afforestation and infant health: Evidence from MillionTreesNYC**

Jones, B. A., & Goodkind, A. L. (2019). Urban afforestation and infant health: Evidence from MillionTreesNYC. *Journal of Environmental Economics and Management*, 95, 26–44.

<https://doi.org/10.1016/j.jeem.2019.03.002>

- Keywords used to find the article: Urban afforestation
- 2 - 3 sentence summary: A 20% increase in urban forest cover decreased prematurity and low birth among mothers in NYC by 2.1 and 0.24 percentage points. Lower particulate matter concentration in urban areas are the most likely causal mechanism behind such results.
- Outcomes: An urban afforestation program (MillionTreesNYC) planted one million new trees in the New York City area between 2007 and 2015 at the cost of 400 million dollars, this implies an increase in the forest canopy of around 20%. The authors compare average newborn children weight and percent premature births among mothers living in the area with a synthetic average of both outcomes from mothers in nearby counties not included in the program.
- Description of the type of study: Observational study that uses the Difference-in-differences method to compare results from the treated group with those from the synthetic control group.

### **Quantifying the impact of educational methods for disaster risk reduction: A longitudinal study assessing the impact of teaching methods on student hazard perceptions**

Parham, M., Teeuw, R., Solana, C., & Day, S. (2021). Quantifying the impact of educational methods for disaster risk reduction: A longitudinal study assessing the impact of teaching methods on student hazard perceptions. *International Journal of Disaster Risk Reduction*, 52(July 2020), 101978. <https://doi.org/10.1016/j.ijdr.2020.101978>

- Keywords used to find the article: citizen science, disaster awareness
- 2 - 3 sentence summary: This article studies a particular Disaster Risk Reduction program using a method called Pictorial Representation of Individual Self Measure (PRISM) to quantify student's self-perception of multi-disaster risk. Risk perception remains relatively constant influenced by the experience of low frequency/high impact events, causing either intensification or decay of such perception.
- Outcomes: the study concludes that the perception of commonly experienced and frequent hazards are closest to actual risk, but the link between consequential and

cascading hazards is not straightforward, DRR is effective to change the perception of certain risks, particularly the less frequent ones.

- Description of the type of study: experimental study carried out in a student cohort in Dominica across a three-year period.

**Risks and Benefits of Green Spaces for Children: A Cross-Sectional Study of Associations with Sedentary Behavior, Obesity, Asthma and Allergy**

Dadvand, P., Villanueva, C. M., Font-Ribera, L., Martinez, D., Basagana, X., Belmonte, J., et al. (2014). Risks and Benefits of Green Spaces for Children: A Cross-Sectional Study of Associations with Sedentary Behavior, Obesity, Asthma, and Allergy. *Environmental Health Perspectives*, 122, 1329–1336. <http://dx.doi.org/10.1289/ehp.1308038>

- Keywords used to find the article: Urban tree cover
- 2 - 3 sentence summary: This is another study that finds positive health effects of an increased urban tree cover, this time they measure changes in tree cover using satellite images and observed health outcomes on a community in Spain. A more extensive tree cover is related to decreased incidence of obesity, but not with asthma and respiratory diseases.
- Outcomes: Supports the conclusion that an increased tree cover leads to better health outcomes for individuals living in that area.
- Description of the type of study: observational study using satellite data and reported health outcomes.