

Exposición a la Contaminación del Aire en Comunidades: Estudios, Motivaciones y Justicia Ambiental

Lupita D. Montoya, PhD

2022-2023 Fulbright – Garcia Robles Scholar

Universidad Autónoma de Baja California, Tijuana Mexico (host)

San Diego State University (home)

University of Colorado Boulder*

Marzo 23, 2023

CASAP

Santa Marta, Colombia



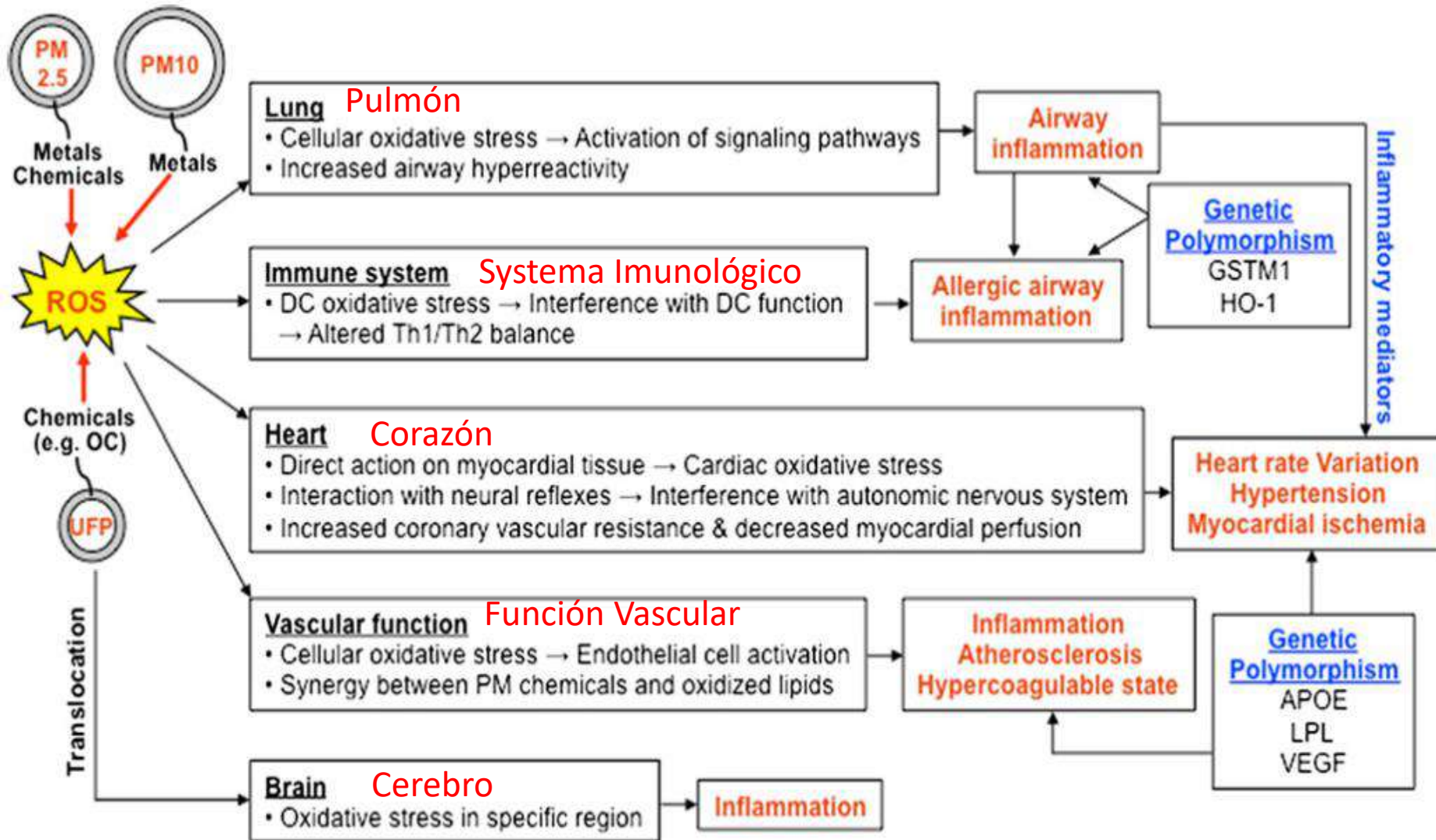
Mi Educación

BS	ME (Mecánica Aplicada)	California State Univ., Northridge
MS	ME (Ciencias Térmicas)	Stanford University
PhD	Env. E. (Bioaerosoles; interiores)	Stanford University
Postdoc	Env. Health (Invest. en Com.)	State Univ. of New York, Albany
Postdoc	Env. Health (Tox. & Métodos)	Harvard School of Public Health

Esquema

- Material Particulado y la Salud Humana
- Estudios en Comunidades y sus Movitacions
 - Nación Mohicana (NY, USA)
 - Langui, Perú (Zona Alto Andina)
 - **Latinos in Boulder (CO, USA)**
 - **Santiago y Temuco (Chile)**
 - **Nación Navajo (NM, USA)**
 - Salones de Uñas (CO, USA) **HBO Max Documentary *Not So Pretty***
 - Radón en Puerto Rico (USA)
 - Laboratorios de Odontología (Tijuana, Mexico)
- COVID-19 y la Contaminación del Aire
- Justicia Ambiental y Diversidad en la Ciencia
- Siguietes Pasos

Mecanismos de Efectos de Salud del Material Particulado



Qué Causa el Estrés Oxidativo?

- Compuestos Orgánicos
 - Hidrocarburos Poly-Aromaticos- (PAHs)
 - Derivados de PAH Oxidados
 - Metales transitivos (e.g., Fe, Cu)
- Endotoxinas (polvo, desechos de animals, comida, etc.)
- Diámetros más pequeños = más reactivos
 - Emisiones de leña y carbon de estufas residenciales emiten nanopartículas

Calidad del Aire en Interiores

Algunos Estudios

Research

Open Access

Childhood asthma and indoor allergens in Native Americans in New York

Simona Surdu¹, Lupita D Montoya², Alice Tarbell³ and David O Carpenter*⁴

Address: ¹Department of Epidemiology & Biostatistics, School of Public Health, University at Albany, SUNY, One University Place, Room 127, Rensselaer NY, 12144-3445, USA, ²Department of Civil & Environmental Engineering, Rensselaer Polytechnic Institute, 110 8th Street, MRC 315, Troy NY, 12180, USA, ³Akwesasne Task Force on the Environment, Hogansburg NY 13655, USA and ⁴Institute for Health and the Environment, University at Albany, SUNY, 5 University Place, A217, Rensselaer NY, 12144-3429, USA

Motivation:

Evaluar la correlación entre la exposición a alérgenos interiores y el asma infantil.

Results:

Alrededor del 80% y 15% de las muestras tenían niveles de alérgenos a ácaros del polvo y gatos, respectivamente, por encima de los niveles de sensibilización.

La asociación entre el asma y la exposición a alérgenos de ácaros de polvo y gato fue positiva pero no estadísticamente significativa.



Figure 1
Map of the Akwesasne.

Indoor Air Pollution in an Indigenous Highlands Community in Peru

Odessa M. Gomez, Alina M. Handorean, Erica L. Brandt, Amalia A. Lopez,
Mark T. Hernandez, Lupita D. Montoya*

University of Colorado at Boulder, Boulder, CO

*Corresponding email: Lupita.Montoya@colorado.edu

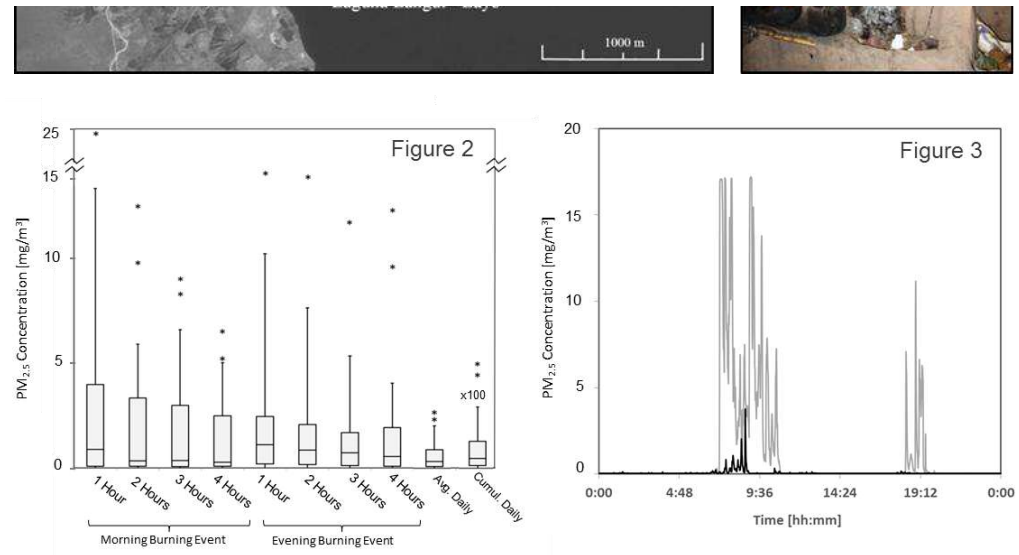
Nueva Motivación:
Estudiar la sinergia entre la exposición a aerosoles de combustión y biológicos en lugares interiores, sobre todo en lugares pobres, donde pueden alcanzar altos niveles.

Implementación de una estufa mejorada producida con materiales locales, en Langui Perú.

Results:

100% uso residencial de bosta.
Reducción del 99% en PM_{2.5} y 96% en carbon negro en emisiones.

Proceedings of Indoor Air 2011



Latinos en Boulder, CO

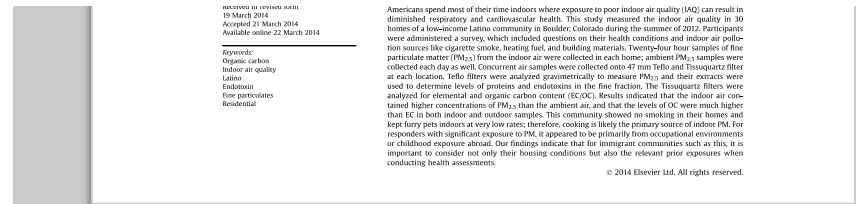
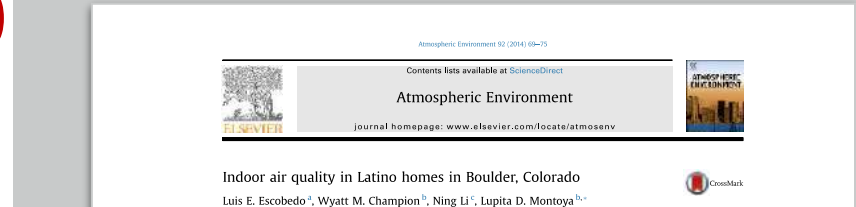
Escobedo et al., 2012

PUNTOS DESTACADOS:

- $PM_{2.5}$ y carbon orgánico fueron más altos en interiores
- **Historias de exposición a $PM_{2.5}$ fueron primamente en lugares ocupacionales y durante la infancia en México**
- Mascotas con pelo dentro de las casas eran raras; endotoxinas en algunas casas
- **Hacinamiento o amontonamiento era alto y la calidad de la vivienda era baja**
- Todas las encuestas fueron hechas en Español

Me integré al Comité de Planificación de la Ciudad de Boulder para promover la vivienda asequible y la equidad en la ciudad.

INVESTIGACION



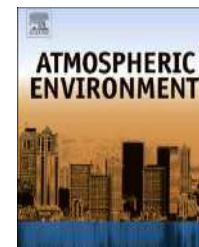
SERVICIO



Contents lists available at [ScienceDirect](http://www.sciencedirect.com)

Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv



Indoor PM_{2.5} in Santiago, Chile, spring 2012: Source apportionment and outdoor contributions



Francisco Barraza ^a, Héctor Jorquera ^{a,*}, Gonzalo Valdivia ^b, Lupita D. Montoya ^c

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^b Departamento de Salud Pública, Pontificia Universidad Católica de Chile, Marcoleta 340, Santiago 8330033, Chile

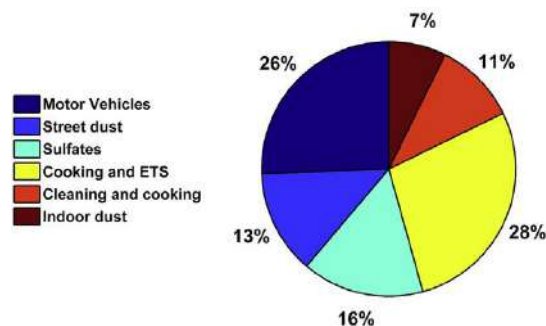
^c Civil, Environmental and Architectural Engineering Department, University of Colorado Boulder, UCB 428 Boulder, Colorado, USA

HIGHLIGHTS

- First source apportionment of indoor PM_{2.5} conducted at Santiago, Chile.
- Outdoor and indoor sources each contribute half of the measured indoor PM_{2.5}.
- Traffic and indoor cooking are the strongest sources of indoor PM_{2.5}.
- Indoor concentrations of PM_{2.5} were affected by socioeconomic status.

GRAPHICAL ABSTRACT

Indoor PM_{2.5} at Santiago, Spring 2012





Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

Environmental Pollution

journal homepage: www.elsevier.com/locate/envpol



Indoor PM_{2.5} in an urban zone with heavy wood smoke pollution: The case of Temuco, Chile[☆]



Héctor Jorquera ^{a,*}, Francisco Barraza ^b, Johanna Heyer ^a, Gonzalo Valdivia ^c,
Luis N. Schiappacasse ^d, Lupita D. Montoya ^e

Motivation:

Evaluate exposure to indoor PM_{2.5} in Temuco, Chile.

Results:

68% of indoor PM_{2.5} comes from infiltration of high outdoor pollution and relatively high household air exchange rates.





Perception, culture, and science: A framework to identify in-home heating options to improve indoor air quality in the Navajo Nation



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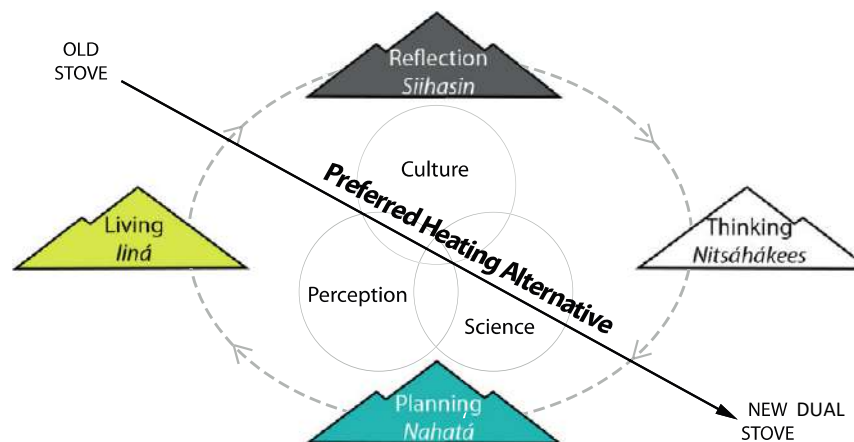
^c United States Environmental Protection Agency, Region 9 Air Division, Air Toxics, Radiation, and Indoor Air Office, 75 Hawthorne St, San Francisco, CA 94105, United States

^d United States Environmental Protection Agency, Office of Research and Development, 944 E. Harmon Ave., Las Vegas, NV 89119, United States

HIGHLIGHTS

- A new framework for identifying appropriate heating alternatives for the Navajo Nation is proposed
- This framework balances reducing health and environmental impacts with Navajo culture, perception, and technical assessment
- This assessment uncovered discrepancies between community perception and the technical results
- Involvement of the Navajo Nation people at the onset and throughout a study such as this, is critical to a successful result

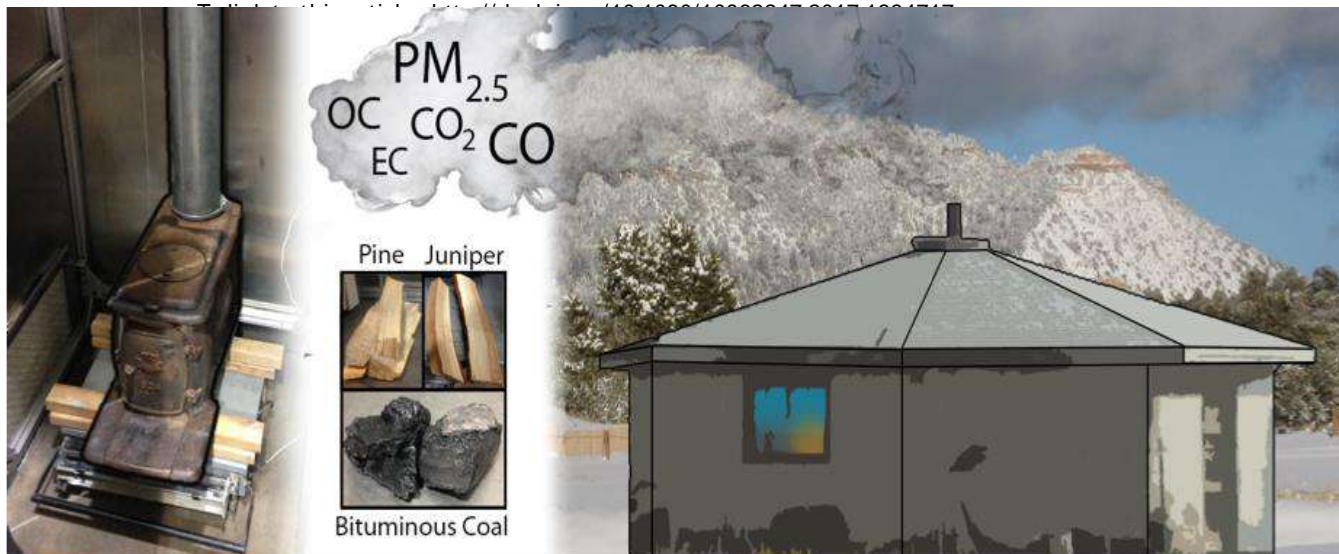
GRAPHICAL ABSTRACT



Emission factors of fine particulate matter, organic and elemental carbon, carbon monoxide, and carbon dioxide for four solid fuels commonly used in residential heating by the Navajo Nation

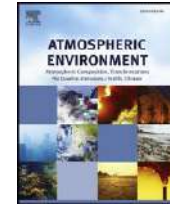
Wyatt M. Champion, Lea Connors & Lupita D. Montoya

To cite this article: Wyatt M. Champion, Lea Connors & Lupita D. Montoya (2017): Emission factors of fine particulate matter, organic and elemental carbon, carbon monoxide, and carbon dioxide for four solid fuels commonly used in residential heating by the Navajo Nation, Journal of the Air & Waste Management Association, DOI: [10.1080/10962247.2017.1334717](https://doi.org/10.1080/10962247.2017.1334717)



Contents lists available at ScienceDirect

Atmospheric Environment

journal homepage: www.elsevier.com/locate/atmosenv

Evaluation of cellular effects of fine particulate matter from combustion of solid fuels used for indoor heating on the Navajo Nation using a stratified oxidative stress response model



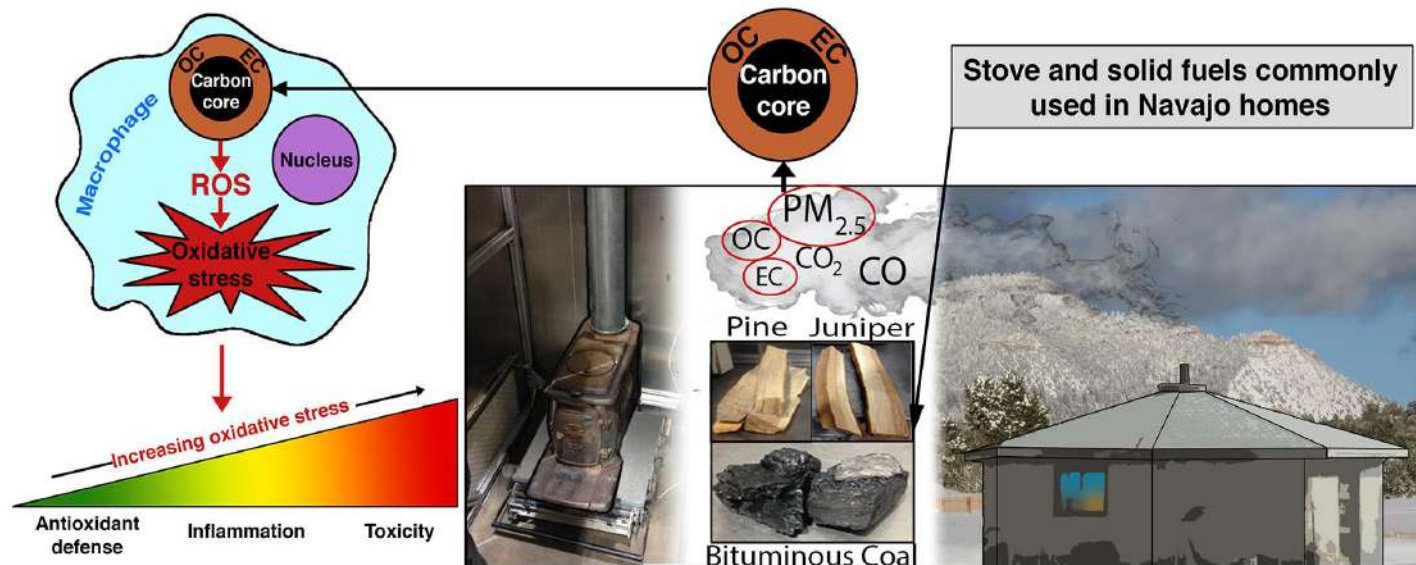
Ning Li^a, Wyatt M. Champion^b, Jemal Imam^c, Damansher Sidhu^a, Joseph R. Salazar^d, Brian J. Majestic^d, Lupita D. Montoya^{b,*}

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^c University of Colorado Boulder, Molecular, Cellular, and Developmental Biology Department, UCB 347, Boulder, CO, 80309, USA

^d University of Denver, Department of Chemistry and Biochemistry, 2190 E. Iliff Ave., Denver, CO, 80208, USA



Three-tier Oxidative Stress Response Model



Oxidative stress (Tier)		None	1	2	3
Cellular response			Antioxidant defense	Inflammation	Cytotoxicity
Endpoints			HO-1	TNF α	Cell viability
PM effects	PP-wood		+++	+++	-
	UJ-wood		++	-	-
	BM-coal		+	+	-
	FR-coal		+	-	-

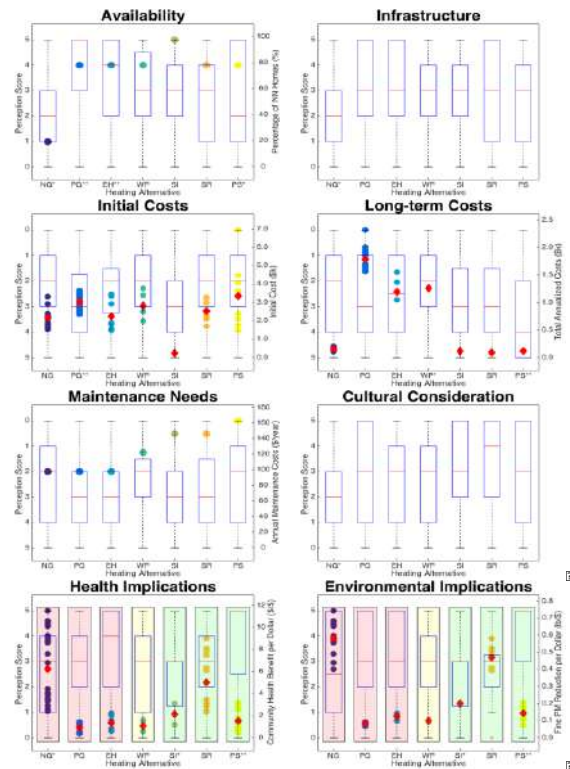


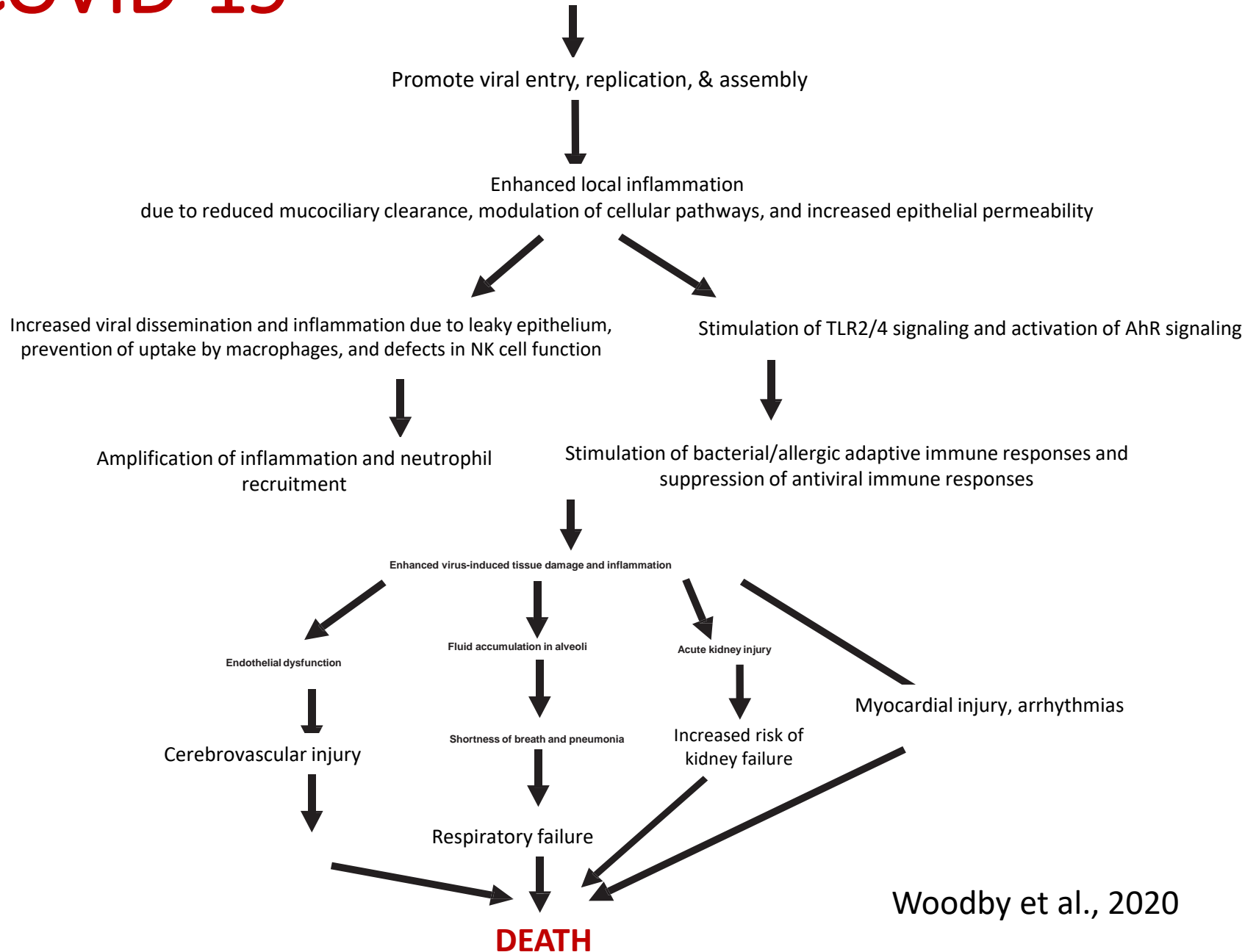
Figure 3. Integrated Results of Perception, Cultural, and Technical Assessments. The Perception Assessment is indicated as boxplots on the y-axis and a higher score is perceived as more feasible based on the criteria evaluated. The red line represents the median Perception score for that alternative, the bottom and top lines in the box represent the first and third quartiles representing the interquartile range (IQR), the whiskers represent 91% and 10%. For the criteria quantified by cost (IC, LC, and MN), a higher perception score would be perceived as “more feasible” or less expensive; therefore, the left y-axis (and quartiles) are flipped for these alternatives. Alternatives perceived as least feasible are denoted with * next to their initials on the x-axis and those that are most feasible are denoted with **. Results of the Cultural Assessment were superimposed on the HI and EI sub-panels, where red, yellow, and green



Champion et al, 2017.

COVID-19

Exposure to air pollutants



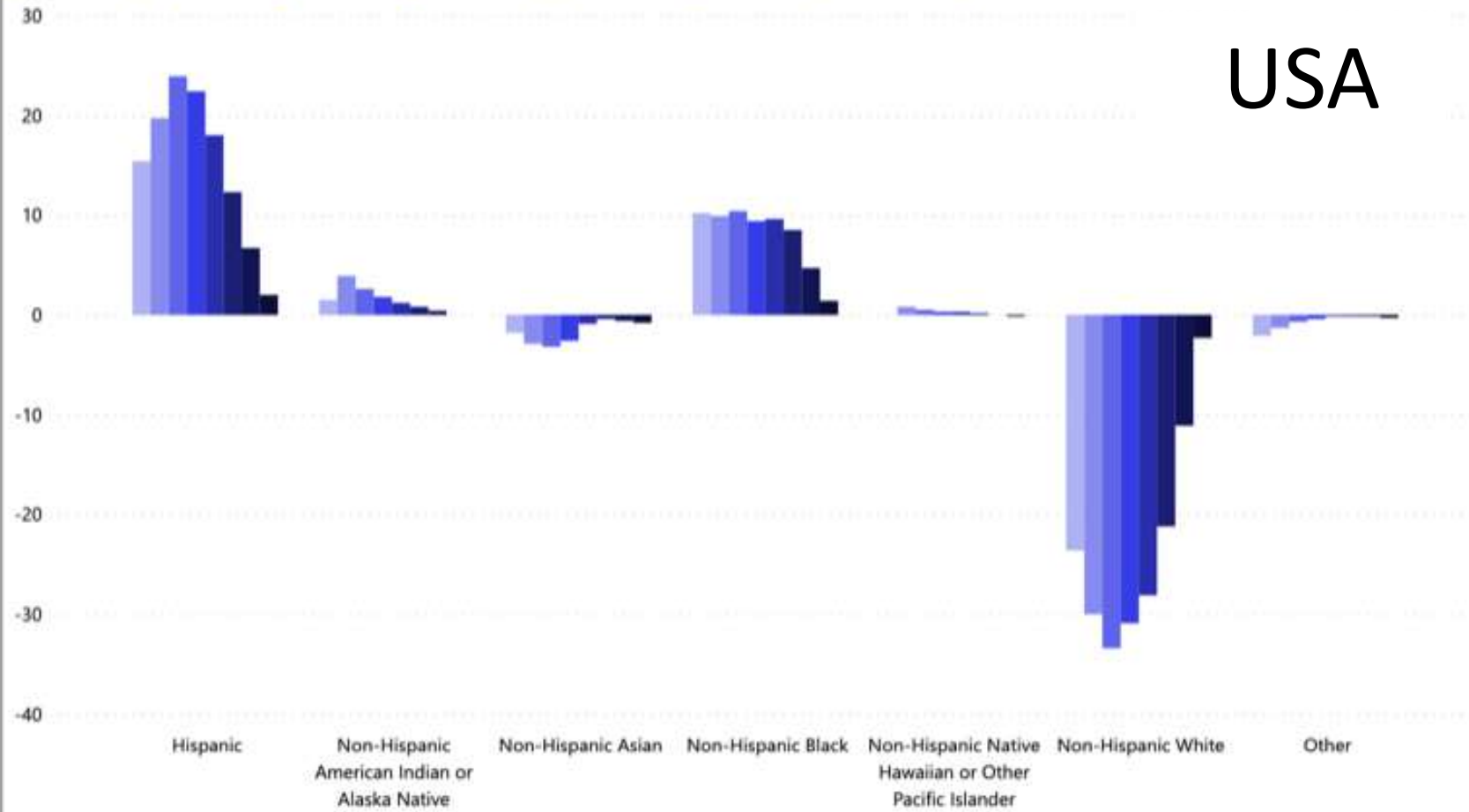
Woodby et al., 2020

Figure 3a. Age-specific differences between the percent of COVID-19 deaths and the population distribution, grouped by race and Hispanic origin

Select a jurisdiction:

United States

● 0-24 years ● 25-34 years ● 35-44 years ● 45-54 years ● 55-64 years ● 65-74 years ● 75-84 years ● 85 years and over



USA

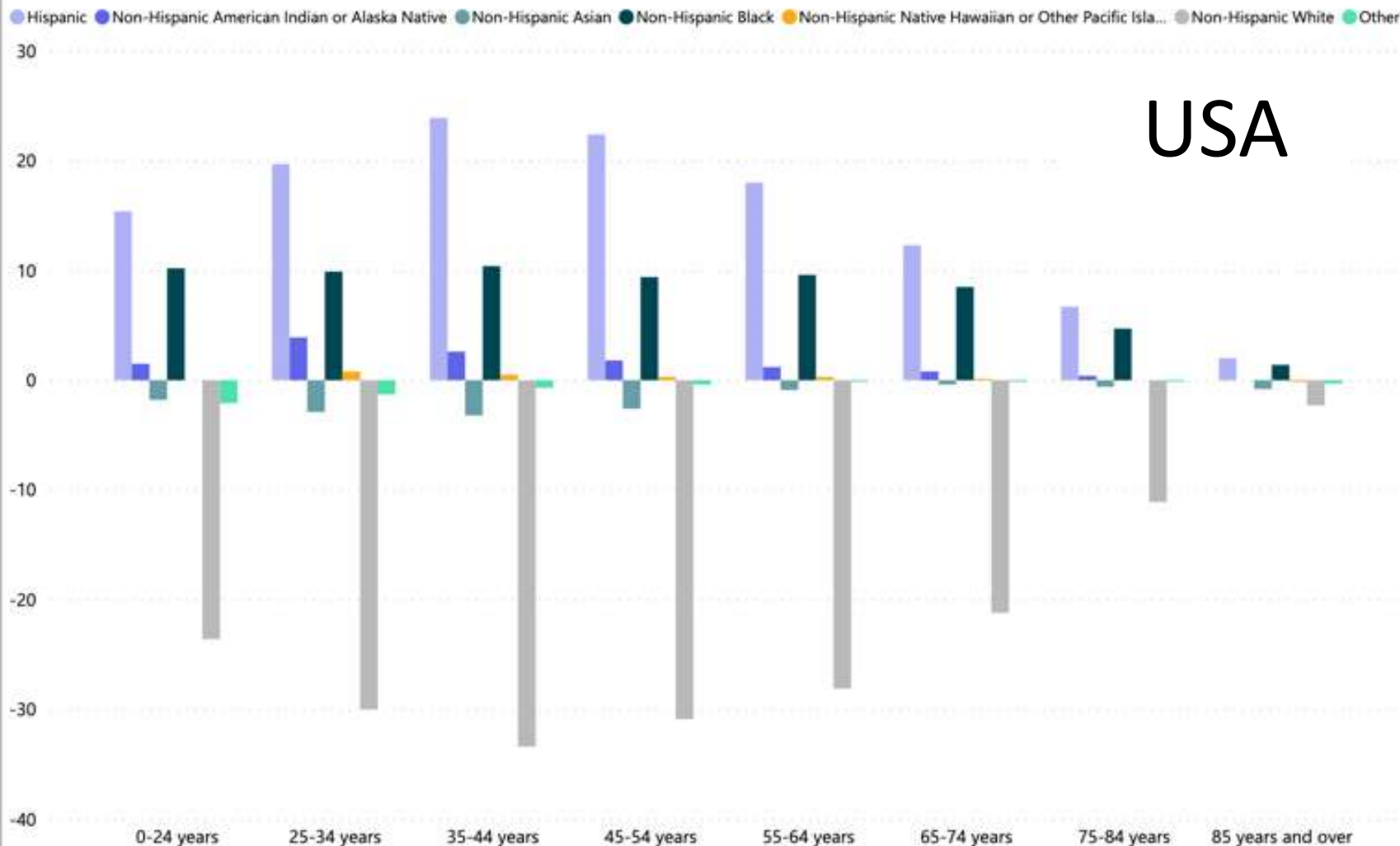
Data Table

CDC 2021

Figure 3b. Differences by race and Hispanic origin between the percent of COVID-19 deaths and the population distribution, grouped by age

Select a jurisdiction:

United States



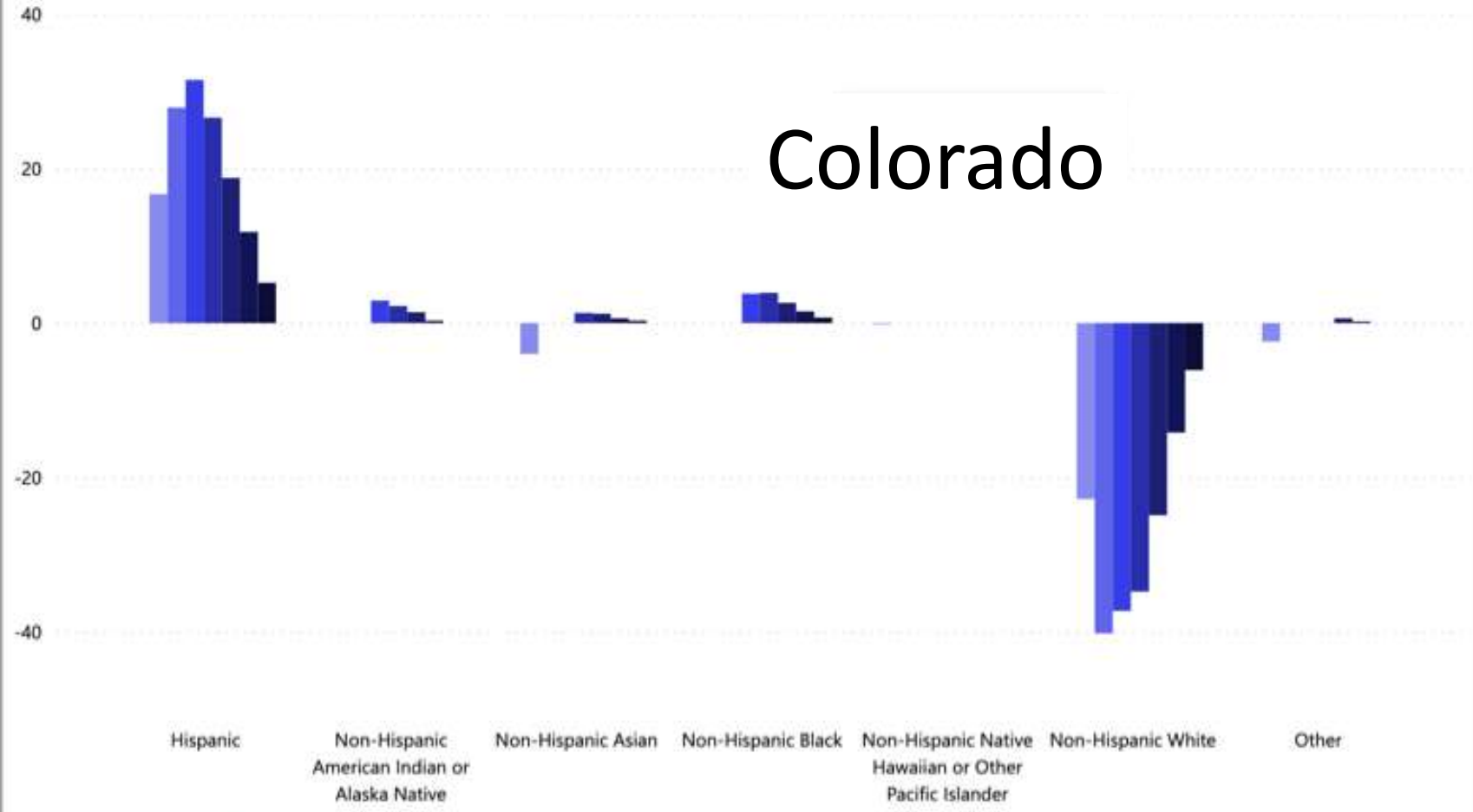
[Data Table](#)

CDC 2021

Figure 3a. Age-specific differences between the percent of COVID-19 deaths and the population distribution, grouped by race and Hispanic origin

Select a jurisdiction:
Colorado

0-24 years 25-34 years 35-44 years 45-54 years 55-64 years 65-74 years 75-84 years 85 years and over



Data Table

CDC 2021

The Stanford Daily

<https://stanforddaily.com/2021/05/13/op-ed-listen-to-black-latinx-and-indigenous-scholars-in-this-pandemic/>

Op-Eds

From the Community | Listen to Black, Latinx and Indigenous scholars in this pandemic



Dr. Lupita Montoya, courtesy of the author

By [Lupita Montoya](#)
May 13, 2021

Black, Latinx, and Indigenous people in the US are disproportionately impacted by the COVID-19 pandemic, with higher mortality rates, and more economic fallout and educational setbacks for our children. In Colorado, where I live, a higher percentage of the Latinx population has died from COVID-19 than any other group, according to the CDC.

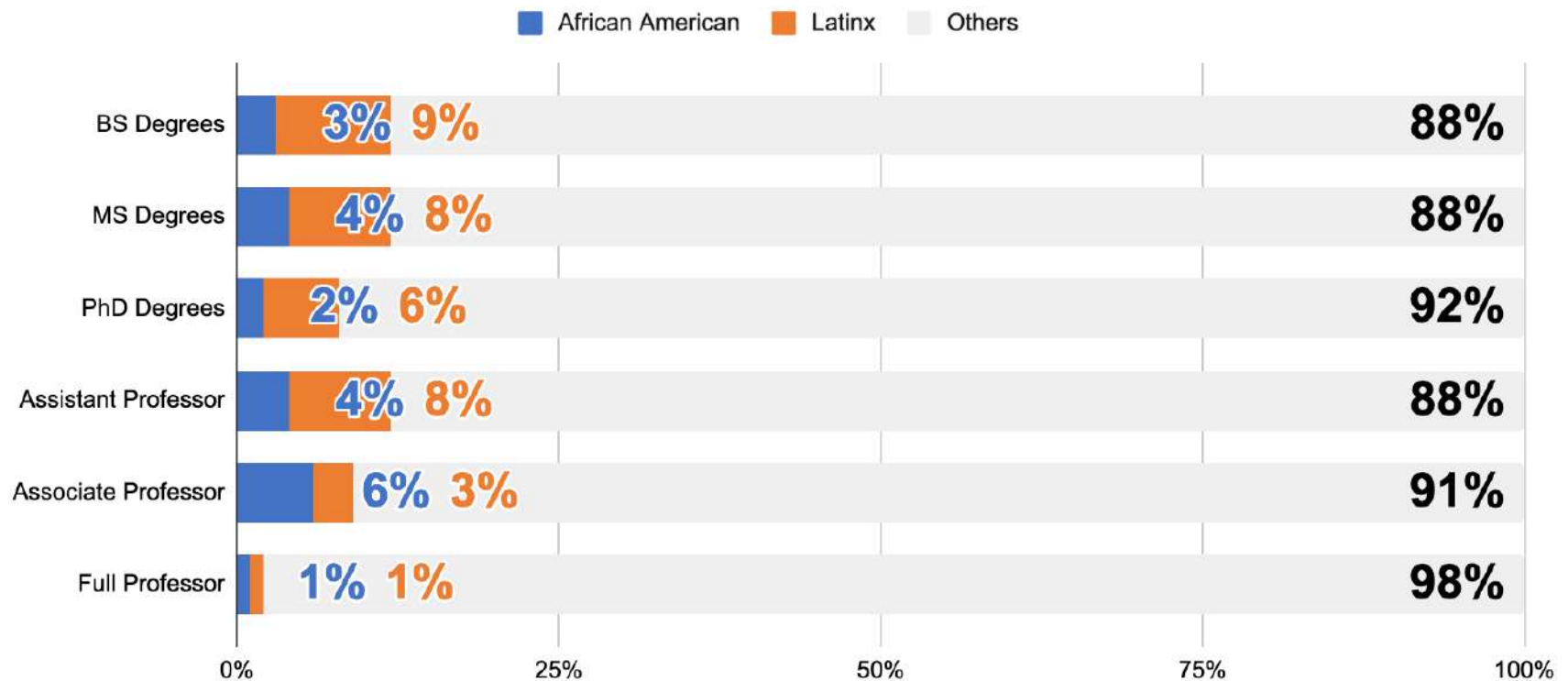
Justicia ambiental,
la falta de diversidad en la academia,
y
el tabú de la investigación en nuestras
propias comunidades

The Brown-on-Brown Research Taboo

Datos Demográficos en Ingeniería Ambiental en USA

Numero de Nativos Americanos son muy pequeños para visualisarse aquí

African American, Latinx and Others in EnvE



Académicos Afroamericanos, Latinos e Indígenas en los Estados Unidos

- Barber P., Hayes T., plus 10,000+ signatories. (2020). **Systemic Racism in Higher Education**. *Science* [Letter to the Editor].
- **#ShutDownSTEM day** (June 10, 2020)
 - Worldwide shutdown of academia
 - I filed a lawsuit against the University of Colorado
- Statement by **Dr. Cornel West** regarding tenure at Harvard
 - Tenure is about supporting the system in place, not about scholarship

Orden Ejecutiva de la Casa Blanca para Avanzar la Equidad Racial y Apoyar a Comunidades Desatendidas (Enero 2021)

which states “...the Federal Government should pursue a comprehensive approach to advancing equity for all, including people of color and others who have been historically underserved, marginalized, and adversely affected by persistent poverty and inequality...”

2022-2026 US EPA Plan Estratégico

incorporated a fourth principle “Advance Justice and Equity” to the previous three principles articulated by EPA’s first Administrator, William Ruckelshaus, to follow the science, follow the law, and be transparent.

Publicaciones Recientes

- Montoya L.D., Mendoza L., Prouty C., Trotz M., Verbyla M., (2021). “Environmental Engineering for the 21st Century: Increasing Diversity and Community Participation to Achieve Environmental and Social Justice”, *Environmental Engineering Science* 38(5): 288-297.
- Ornelas Van Horne Y.#, Alcalá C.S., Peltier R.E., Quintana P.J.E., Seto E., Gonzales M., Jonhston J., Montoya L., Quirós-Alcalá L., Beamer P.I., (2022). “An Applied Environmental Justice Framework for Exposure Science”, *Journal of Exposure Science and Environmental Epidemiology*, 1-11.

No Somos “Los Pobrecitos”: Persiguiendo Investigación con la Participación de la Comunidad y Justicia

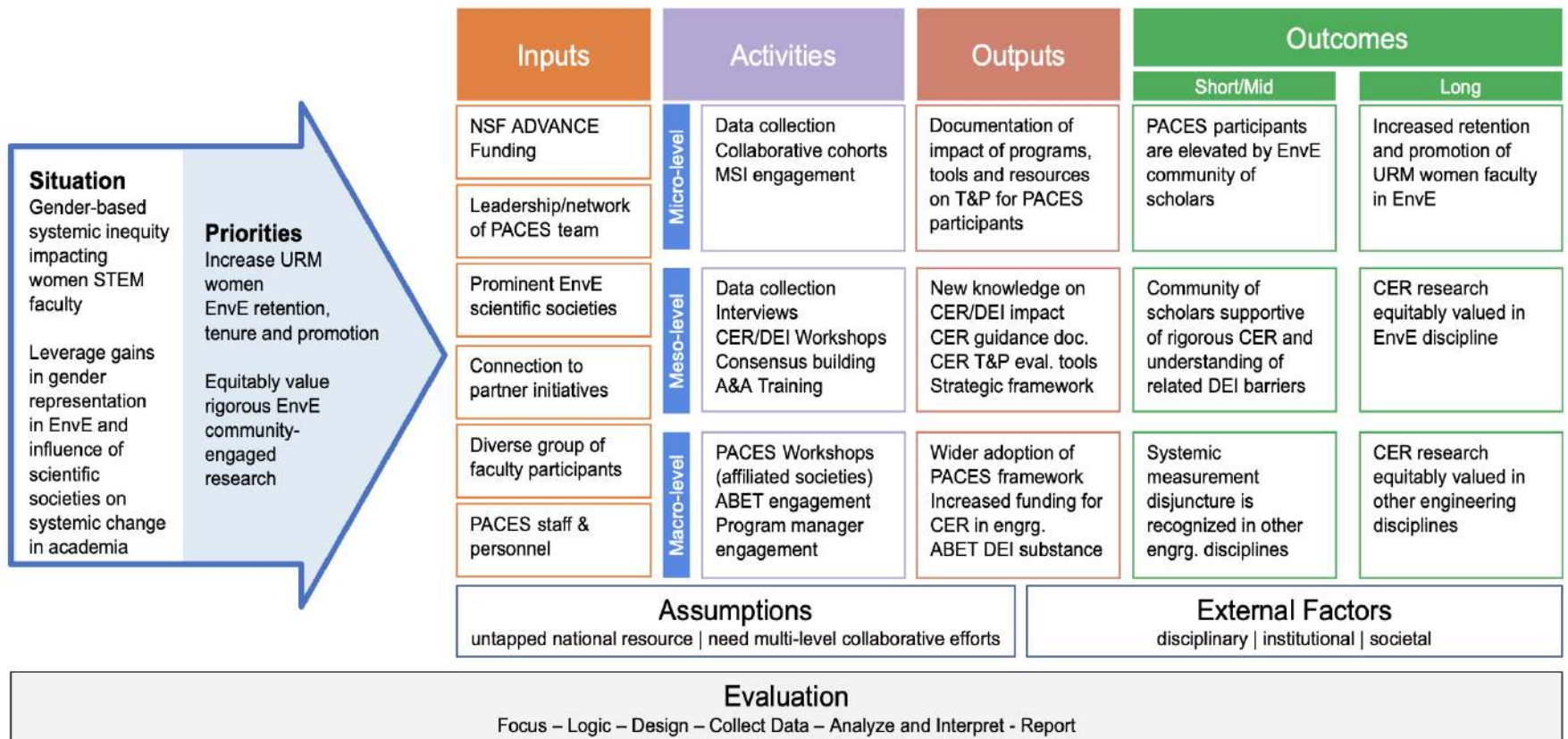
Montoya, L.D. (2022). Guest Editorial: We are Not “Los Pobrecitos”: Pursuing Community Engaged Research and Justice. *International Journal for Service Learning in Engineering, Humanitarian Engineering and Social Entrepreneurship*, 17(2): 2 pp.



ADVANCE Strategic Partnership for Alignment of Community Engagement in STEM (SPACES)



Para Promover Investigación con Comunidades and Apoyar Mujeres Académicas, sobre todo Afroamericanas, Latinas e Indígenas, que conduzcan este tipo de investigación en Environmental Engineering y disciplinas aledañas



The Washington Post

World is on brink of catastrophic warming, U.N. climate change report says

A dangerous climate threshold is near, but 'it does not mean we are doomed' if swift action is taken, scientists say



By [Sarah Kaplan](#)

Updated March 20, 2023 at 5:33 p.m. EDT | Published March 20, 2023 at 9:01 a.m. EDT

El mundo está al borde del calentamiento catastrófico, dice el reporte sobre el Cambio Climático de las Naciones Unidas (Marzo 20, 2023)



Escuchemos el llanto de la Tierra y
el llanto del pobre!

Laudato Sí, Papa Francisco

Acknowledgements



Navajo Nation
Environmental Protection Agency

Boulder CO Study

Luis E. Escobedo, MD
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Perry Charley
Neilroy Singer



University of Colorado
Boulder

Dr. Wyatt Champion
Naomi Chang



Katie Stewart
Jim Jetter
Dr. Jacky Rosati
Dr. Paul Solomon
Kristy Miller

Chris Yazzie
Sky Izzo
Glenna Lee
Eugenia Quintana
Michael King
Tennille Denetdeel

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