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After 121 Years, It's Time to Recognize W.E.B. Du Bois as a Founding Father of Social Epidemiology

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Some sociologists referred to W.E.B. Du Bois, a 19th century sociologist, as the founding father of American Sociology due to his trailblazing social science research, The Philadelphia Negro. However, The Philadelphia Negro globally revolutionized social science and epidemiological research that expands far beyond sociology and the United States. This study, which was groundbreaking for its era in its implication of social, spatial, intercultural, and intracultural health determinants, authenticated the existence of racial disparities and how systemic inequalities impact health. Du Bois was a social epidemiology frontrunner, yet compared to his contemporaries, acknowledgment of his global contributions to social epidemiology has been practically mute. It is time that Du Bois and Duboisian research are fully acknowledged in the social epidemiology field.

Keywords*: W.E.B. Du Bois, Duboisian research, social epidemiology, The Philadelphia Negro*

EPIDEMIOLOGY ACCOLADES WELL OVERDUE FOR W.E.B. DU BOIS

The health and well-being of a human is a universal right that should never be discriminately racialized (Krieger, 2000a; Ozar, 1981). Exacerbating unequal treatment in health and health care diminishes the life value of one racial or ethnic group over another (Nelson, 2002). Over a century ago, William Edward Burghardt (W.E.B.) Du Bois, a global scholar, valiantly confronted the systemic inequalities in America and around the world (Broderick, 1958; Gott, 2000). As a global scientist, his research and scholarly works expanded from the United States to Africa, Europe, the Caribbean, and beyond (Sambaluk, 2014; Valdez, 2016).

However, it was in the *Philadelphia Negro* study that Du Bois first infused social epidemiology into his Duboisian research. Social epidemiology is a subdivision of epidemiology that emerged in the 19th century when Louis-Rene´ Villermé examined the health associations of poverty and mortality (Julia & Valleron, 2011). If epidemiology is the study of disease distributions and determinants of health (Detels, 2002; Last, Abramson & Freidman, 2001; (World Health Organization [WHO], 2018), social epidemiology is the branch of epidemiology which systemically assesses the protective or deleterious impacts that social structural factors (i.e., social class, education, policies, practices, etc.) have on health and disease distributions (Honjo, 2004; Julia & Valleron, 2011).

Du Bois' 1899 study examined racism as a systemic culprit that resulted in widespread social exposure to inequalities in socioeconomic status, education, criminal justice, and employment among citizens of the 7th Ward in Philadelphia (Brown & Fee, 2003; Du Bois & Eaton, 1899). Du Bois' *Philadelphia Negro* study replicates the epidemiologic triangle model (e.g. host, agent and environment) that researchers use to study health problems (Gordon, 1954). This triad is a valuable tool to translate empirical research into systemic change and practices through public policy development (Johnson-Walker & Kaneene, 2018) by identifying exposures to the vector that trigger transmittable health risks and determinants of death in an environment (Ewald, 1991). A

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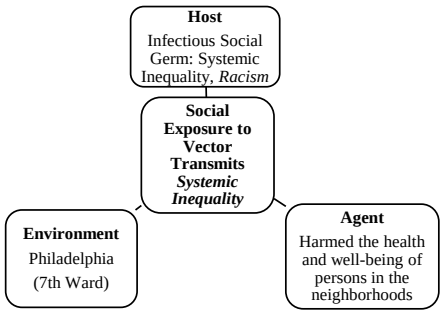
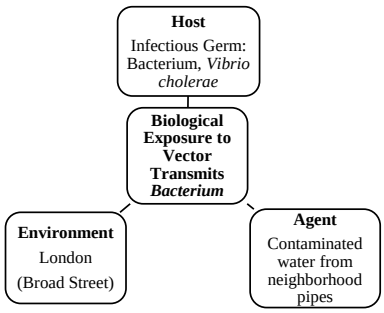
vector is a living organism that carries the infectious germ and then transmits the germ to the host (Wilson et al., 2017). In this article, the term *vector* is operationalized to include a microorganism or human (Krieger, 2000b; Rogers, 1962). So whether or not the host is socially or biologically exposed to the infection of systemic inequality (e.g., racism; as Du Bois, 1899 is depicted in Figure 1a) or bacterium (e.g. vibrio cholerae; as Snow, 1855 is depicted in Figure 1b), the vector's transmission is a health risk and a determinant of death to that environment (Agar, 2003; see Figure 1a).

Figure 1a. Du Bois' Epidemiological Triangle for Social Exposure to Health Risks and Determinants of Death



Note. Figure 1a depicts the three factors (e.g., host, agent, and environment) that W.E.B. Du Bois identified to study the social exposures of Black-White mortality disparities in Philadelphia during the 19th century.

Figure 1b. Snow's Epidemiological Triangle for Biological Exposure to Health Risks and Determinants of Death



Note. Figure 1b depicts the three factors (e.g., host, agent, and environment) that John Snow identified to study cholera cases in London during the 19th century.

When Du Bois escalated his study to survey the relationships between social-structural factors of race and racism, area-level health, disease distributions, and mortality rates in the 7th Ward in Philadelphia, he was conducting a social epidemiological study. Examining the social, economic, environmental and political systemic inequalities as exposures for health outcomes was revolutionary during the 19th century (Geronimus, 2000; Green & Wortham, 2018). Subsequently, as documented in the Institutes of Medicine's *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care Report*, it took the United States over 100 years since Du Bois' work to formally acknowledge that there are racial and ethnic disparities in health and health care (Institute of Medicine, 2003; Nelson, 2002). In that same century-old timeline, only a few scholars have acknowledged Du Bois and his *Philadelphia Negro* study's sociological and public health contributions (Gee & Ford, 2011; Krieger, 2000a; White, 2011; Williams & Sternthal, 2010). For the most part, Du Bois' foundational public health contributions to the field of social epidemiology remain unacknowledged or under-acknowledged.

Some researchers minimize Du Bois' scholarly contributions and question his comparison to scholarly contemporaries like Marx, Durkheim or Weber (Hughey & Goss, 2018; Rudwick, 2017). However, compared to his scholarly contemporaries of the 19th century, the social epidemiological context of the methodologies Du Bois used were just as revolutionary as his study's outcomes (Clark, Auerbach, & Xuan Zhang, 2018; Hinchey, 2018; Krieger, 2000b). Unlike his White contemporaries of sociology, social epidemiology, and Western medicine, Du Bois has never been given the transdisciplinary and scientific accolades due him (Harrell et al., 2011). Globally and nationally, an insufficient number of sociologists have even asserted him as the founding father of

American sociology for his sociohistorical contributions to social science research (Anderson & Massey, 2001; Chandler, 1996; Morris, 2015; Rabaka, 2017). As it relates to social epidemiology, a 478- page book titled, *Methods in Social Epidemiology* chronicles the history of social epidemiology, yet it never mentions Du Bois or the social epidemiologic methods used in any of his Duboisian research (Hamlin, 2006). Particularly in *The Philadelphia Negro* and *The Health and Physique of the Negro American* studies, Du Bois associated systemic inequalities of racism to the racial and ethnic disparities in both the distributions of disease and societal power (Du Bois, 1901, 1906; Jones-Eversley, 2009). Even the medical field has failed to acknowledge Du Bois' biomedical works that globally examined the health and well-being of Blacks compared to other racial and ethnic groups (Byrd, 1990; Jerabek, 2016).

Critical race theory offers a framework for understanding why Du Bois, a Black/African American scholar, is unacknowledged or under-acknowledged in the field of epidemiology (Delgado & Stefancic, 1998). Similar to Du Bois' early research on race, power, classism, and racism, critical race theory views race as a polarizing hierarchical and sociopolitical construct that values, acknowledges and privileges only Whites while it systematically devalues, dehumanizes and discriminates against non-Whites (Delgado & Stefancic, 2001; Popenoe, 2000). The critical race theory's sentiments of exclusion and omission would explain Du Bois' lack of social epidemiological accolades due him (Huber & Solórzano, 2015), and why White scholars who have made similar contributions have rose to prominence instead. The scholarly works of scholars of color, like Du Bois, are too often devalued by the academy (Hughey & Goss, 2018; Villalpando & Bernal, 2002). Duboisian research notes racism as the "color line" of the 20th century that separated Whites and Blacks (Du Bois, 1901, 1953; Thomas, 2001), and his own race assignment and possibly his research focus on racism may both contribute to his value being overlooked. Unfortunately, in the 21st century, undervalued scholars of color and scholarship on race and racism remains a challenge throughout academia (Hendrix, 2005; Stewart & Sweetman, 2018).

Given Du Bois' groundbreaking contributions to the study of social determinants of both health and death, these authors, two social epidemiologists, find that his work should have greater recognition in epidemiology. This commentary exclusively revisits the *Philadelphia Negro* to highlight Du Bois' social epidemiological methodologies and duly validate Du Bois as a founding father of social epidemiology. While he had many works, Du Bois' *Philadelphia Negro* was the first scientific study on race (Zuberi, 2004) where he specifically used empirical data to link structural racism to the poor health and high mortality among Blacks in the 7th Ward (Banton, 2012; Du Bois & Eaton, 1899, Green & Wortham, 2018). Therefore, a century-old honor to Du Bois, a pioneering scientist, is well overdue. Through social epidemiology, Du Bois showed the world how the intersectionality of social, political, environmental, and economic factors influences health and death. First, the authors briefly trace the history of epidemiology and social epidemiology, pointing to how Du Bois' work both fit in and stood out from his predecessors and contemporaries. In the end, specific recommendations are offered for how a Duboisian framework can continue to improve our social epidemiology science.

HISTORY OF EPIDEMIOLOGY

As a population-based science of public health, epidemiology research must align with the ultimate public health goals to study barriers and opportunities of health in order to:

- prevent illnesses and premature deaths,
- promote healthy lifestyles, and
- protect the health and well-being of people and the communities where they "live, work, learn and play" (Axelsson & Axelsson, 2006; American Public Health Association [APHA], 2018; Rosen, 1993).

There are six key principles to modern epidemiology: (a) public health surveillance, (b) field investigation, (c) analytic studies, (d) evaluation, (e) linkages, and (f) policy development (Centers

for Disease Control and Prevention, 2018). These principles have grown from early epidemiologic investigations.

In 400 B.C., the first epidemiologist was Hippocrates, a physician who studied the variations and environmental context of diseases and epidemics (Merrill & Timmreck, 2006). Linking the association of infectious diseases and epidemics to the environment was transformative to the field of epidemiology, and the environmental context continues to influence the way scientists analyzed morbidity and mortality (Giesecke, 2002; Susser & Susser, 1996). In particular, the public health surveillance and field observation techniques that Hippocrates developed continue to be modeled in epidemiology (Wagner et al., 2001).

In 1662, John Graunt, a London draper and ship captain, quantitatively used life tables to document vital information (i.e., age, gender, etc.) and statistically predict survival rates of his study population based on their illness and cause of death (e.g. acute vs. chronic). His statistical study, "Natural and Political Observations Made upon the Bills of Mortality" (Graunt, 1939), resulted in him being globally affirmed as the father of demography and an early contributor to epidemiology (Bull, 1959; Glass, Ogborn, & Sutherland, 1963; Rothman, 1981).

John Snow, the Father of Modern Day Epidemiology

While Hippocrates' and Graunt's research debuted the epidemiological approaches of public health surveillance, field investigation and analytic studies, it was not until two centuries later that John Snow, a physician from London, England, combined surveillance, field investigation and analytic studies with two other epidemiologic methods, evaluation and linkages (Chuang & Reizner, 1993). Snow's evaluation and linkage methods accelerated the evidence-based analysis of epidemiology (Paneth, 2004). Snow scientifically refuted the first half of the 19th century's beliefs that miasma, a word literally meaning "bad air," was the root cause of the cholera, influenza, yellow fever, childbed fever, and other epidemics in Europe (McMichael, 1999). In 1854, Snow mapped neighborhoods in London to research why the cholera outbreak was rapidly spreading in London (Cameron & Jones, 1983; Duncan & Kawachi, 2018). Prior to Snow's study, nearly 75,000 people in London had died from the deadly intestinal infection (Eyler, 1973; Galloway, 1985). Snow's urban surveillance, field investigation, and ethnographic analytic research, evaluation, and linkage identified the epidemiological triad (e.g. host: bacterium, *Vibrio cholerae*, agent: contaminated water pipes, environment: London; see again, Figure 1b). Snow evaluated the biological exposures of the systemic and infrastructural factors in London, and he revealed a direct linkage to a contaminated pump that was contributing to the cholera outbreak and high death rates (Brody et al., 2000; Summers, 1989). He validated how biological exposures to infectious germs in the environment pose micro and macro area-level health risks (Rogers, 1962; Snow, 1855). Hence, Snow's study expounded upon the germ theory's narrow premise that microorganisms invade the body and cause disease (Gooch, 2011). His local study influenced health education, health promotion and public policy regarding safe drinking water, sanitation and hygiene across the globe (Cumming & Cairncross, 2016).

Parallel Methodologies of John Snow and W.E.B. Du Bois' Epidemiological Studies

Drawing parallels between how John Snow's methods and public health impact that earned him the title of a Founding Father of Epidemiology, the authors argue that Du Bois used parallel methods and had impact that warrant naming him a "founding father of social epidemiology." In much the same way that John Snow began to reframe miasma to water sanitation as the root cause of cholera, Du Bois began to introduce systemic inequality of racism as the root cause of diseases and deaths in the 7th Ward in Philadelphia. John Snow, a White 19th century English physician, is globally given the honor as being the "Father of Modern Day Epidemiology" for his intraracial cholera research of deceased White residents in London (Paneth, 2004; Snow, 1885; Vandenbroucke, Rooda & Beukers, 1991; Vachon, 2005). While, W.E.B. Du Bois, a Black 19th

century American sociologist who conducted an interracial (e.g., Black, White, Chinese, Japanese, and Native American) systemic inequality study that evaluated and linked the social exposure of racism to the high prevalence of disease and death among Blacks in Philadelphia (Du Bois & Eaton, 1899), has not received comparable recognition. Snow used an observational study design to estimate causal relationships in public health settings (Kelsey et al., 1996; Wing, Simon, & Bello-Gomez, 2018). Like Snow's cholera study, the *Philadelphia Negro* used an observational study design that employed mixed research methods (e.g. qualitative and quantitative) to examine the systemic inequality of racism as a health risk and determinant of death (Kelsey et al., 1996; White, 2011). Hearkening back to the method that John Snow originally used to trace the cholera epidemic, Du Bois used mapping to show the geographic distribution of individuals by race and economic status and supplemented his data with census estimates and health data (White, 2011).

Similar to how Snow's work embodied modern epidemiology's key principles, in the *Philadelphia Negro* study alone, Du Bois' work clearly addresses each of the principles designated for the broader context of epidemiology. In the 7th Ward, Du Bois engaged in the continuous systemic collection, analysis, interpretation and dissemination of public health-related data in people of various racial groups (*public health surveillance*). Du Bois established the existence of racism in the 7th Ward, and he used scientific, investigative ethnographic and quantitative methods along with existing literature, and empirical data to assess the transmission of racism in the 7th Ward (*field investigation*). He used primary survey data collection and comparative demographic factors (race, sex, etc.), social, behaviors, and spatial factors to assess the health impacts and the contributing factors to the infectious outbreak of racism in the 7th Ward (*analytic studies*). Du Bois' analysis and interpretation of racism led to his summative pronouncement that systemic inequality was associated with increasing health risks and high mortality rates in the 7th Ward (*evaluation*). When he connected the systemic inequality of racism to education, criminal justice, poverty, and employment, Du Bois demonstrated the importance of a multidisciplinary collaborative lens of social epidemiological research (*linkages*). If fully acknowledged for his social epidemiological contributions, Du Bois' recommended interventions and strategies to confront the determinants of health and determinants of death in the 7th Ward would have been well posed for policy development aimed at combating racism and eliminating health disparities, beyond his success in recommending policies to support local health leagues for people of color (*policy development*). Clearly, Du Bois' embodiment of the six key principles of modern epidemiology in the *Philadelphia Negro*, and his novel focus on racism and social inequality as social exposures qualify him as a social epidemiologist.

A full side-by-side comparison (Table 1) shows that *The Philadelphia Negro* was just as, if not more, revolutionary than Snow's observational study because Du Bois' observational study examined the systemic inequality of racism as a contributor to high poverty, high morbidity, poor sanitation, and high mortality among Blacks in the 7th Ward (Du Bois & Eaton, 1899). A comparison of Snow and Du Bois' urban research studies (e.g. Broad Street and 7th Ward) demonstrate that both 19th century scholars modeled the six key principles to epidemiology research and that the variances between the epidemiological studies' designs and methods are minimal. For instance, Snow applied a biological exposure lens to examine cholera in his epidemiological study among an intraracial population of only deceased individuals (Paneth, 2004). And for his innovative epidemiological bacterium research, John Snow is globally recognized as the "father of modern day epidemiology." In contrast, Du Bois' epidemiological systemic inequality research examined living and deceased individuals across race groups. He merged epidemiology methods with social science in his racism study (Du Bois & Eaton, 1899). Even though *The Philadelphia Negro* is the first scientific study on race and the first social epidemiological research on the systemic inequality of racism, W.E.B. Du Bois is not acknowledged as a "founding father of social epidemiology" (Zuberi, 2004).

Table 1

Comparison of Snow and Du Bois' Seminal Epidemiological Studies

		John Snow's Cholera Study in London	**W.E.B. Du Bois' *Philadelphia Negro* Study**
Doctoral Credentials		M.D. from University of London	Ph.D. from Harvard University
Time of Research	Study Commences in the 19th Century	1854	1899
Documentation of Study		Snow, J. (1855). *On the mode of communication of cholera*.	Du Bois, W.E.B., & Eaton, I. (1899). *The Philadelphia Negro: A social study*.
Study Design	Observational Study Design	Snow compared cholera rates by: 1) Regions 2) Exposed vs. non-exposed individuals 3) History of cholera cases and non-cases	Du Bois compared mortality rates by: 1) Regions 2) Exposed vs. non-exposed individuals 3) History of systemic inequality of racism between Blacks and Whites
Duration of Study & Size of Study Population	Numbers of Homes & People Surveyed	Broad Street Cholera Outbreak (UK) Duration: 2 months* Individuals: 197** Homes: 658***	7th Ward in Philadelphia, PA (USA) Duration: 15 months Individuals: 5,000 Homes: 2,500
Public Health Neighborhood Surveillance	Study Population: Population	Intraracial- All White Study Population	Interracial- Black and White Study Population
Field Work	Urban Ethnographic	Yes—London, England (Broad Street)	Yes—Philadelphia, Pennsylvania (7th Ward)
Analytic Studies	Mapped	Yes—High-Density Regions	Yes—High-Density Regions
Evaluation	Public Health Focus	Yes—Transmission of Biological Infections and Their Health and Death Risks	Yes—Transmission of Social Infections and Their Health and Death Risks
Policy Development	Translation of epidemiological research into interventions, practice and policies	Policy recommendations to remove the contaminated pump and influenced the health promotion of safe drinking water, sanitation and hygiene	Policy recommendations for the formation of local health leagues among colored people for the dissemination of better knowledge of sanitation and preventive medicine
Historical Accolades	Globally Affirmed for Contributions to Epidemiology	Yes, Father of Modern Day Epidemiology	Negligible, in comparison with the contributions made; not widespread

Note. *Broad Street Study Duration Source: http://www.ph.ucla.edu/epi/snow/broadstreetpump.html; **Snow's Investigation of Broad Street Deaths http://www.ph.ucla.edu/epi/snow/broadstreetpump.htm; *** Homes Snow visited https://journals.lww.com/epidem/fulltext/2004/09000/Assessing_the_ Contributions_of_John_Snow_to.2.aspx

Emergence of Social Epidemiology

Substantiating Du Bois as a founding father of social epidemiology requires reviewing the history of social epidemiology, and who were Du Bois' contemporaries at the time of his career. Though Du Bois' contemporaries, like Villermé and Virchow who also built on Snow's work, are frequently credited for their contributions to social medicine (McMichael, 1999), Du Bois is rarely acknowledged for his contributions to epidemiology. Du Bois' work in the second half of the 19th century built on the social medicine movement in France, Germany, and England stirred after the Industrial Revolution. The rise of factory work during the Industrial Revolution made it impossible to ignore the extent to which the factory system and working conditions therein impoverished the workers, thus linking poverty and disease. Louis Rene Villermé (1782–1863), a French physician and statistician, and Rudolf Virchow (1821–1902), a pathologist are often credited to advancing the social-environmental etiology and social medicine principles at the time (Berkman & Kawachi, 2000; McMichael, 1999). Villermé conducted the first study showing that those working in different occupations suffered different diseases and is credited as the first to formally describe the association between neighborhoods and health; however, the emphasis of his work was on the effect of social class, and not neighborhood conditions. Virchow focused on political and economic factors as the root causes of the 1848 typhus epidemic and recommended social reform as a solution (Rosen, 1948), and explicitly proclaimed that "medicine is a social science" (Link & Phelan, 1995). In defining a social-environment etiology, these scholars made indelible marks on the field of science. Others like Émile Durkheim (1897) and John Cassel (1976) built on this work to investigate other social factors and health relationships, such as social integration and suicide, and psychosocial pathways between stress and health.

After Villermé and Virchow's investigations, the field of social epidemiology seemingly hums in the background while germ theory and the biomedical model of disease take center stage. Social epidemiology re-emerges in 1950 when Alfred Yankauer first uses the term "social epidemiology" in a publication titled, "The relationship of fetal and infant mortality to residential segregation: an inquiry into social epidemiology" (Yankauer, 1950). This sparks the growing use of the term social epidemiology, which becomes fully codified in 1969 by Reeder in an address to the American Sociological Association, who defined it as the "study of social factors in the etiology of disease." Since then, luminaries like Nancy Krieger have further expanded on the definition of social epidemiology and clarified distinctions between social epidemiology and other similar terms and concepts (Krieger, 2001).

We offer an alternative to the apparent "gap" in time between the late 1800s and the 1950s when social epidemiology seemingly goes dormant in the wake of germ theory's emergence. This is exactly the time period when Du Bois was developing his analysis that was later published as *The Philadelphia Negro,* which Krieger extols as the "first comprehensive in-depth analysis of an urban African-American community and also a path-breaking work in sociology and public health" (Krieger, 2011, p. 119). Despite Du Bois' use of social epidemiology concepts and methods to comprehensively study the social conditions patterning the health of Black Americans, the seminal texts tracing the history of social epidemiology move from the work of Villermé and Virchow to work by Saxon Graham, John Cassel, and Mervyn Susser after the 1960s (Berkman & Kawachi, 2000; Link & Phelan, 1995). There is a fleeting stopover for Greenwood and Sydenstricker (McMichael, 1999), largely overlooking Du Bois as a major contributor to our study of social factors and disease. This minimization of Black scholars' contributions, as posited by critical race theory, gives insight into the alleged gap in the social epidemiology history timeline—the field would rather feign dormancy than give credit to Du Bois, a Black scholar, for moving the field forward.

The Philadelphia Negro, published in 1899, was a groundbreaking, systematic scientifically rigorous investigation that used quantitative and qualitative methods to document and explain the health of African Americans in Philadelphia, Pennsylvania. This extensive work canvassed and interviewed over 2,500 households to characterize health and living conditions, and investigated

education, literacy, occupational status, social participation, religious activity, the local economy, housing, crime, political participation, and health from August 1896 to December 1897 (White, 2011). Alarmingly, many of the social conditions and the health of Blacks have not changed or worsened in over 100 years since of *The Philadelphia Negro* (Table 2). Since Blacks' forced servitude during the 1600s slavery era, Black bodies have been dehumanized and devalued (Kelley & Angel, 1987; Randall, 1996). These sociohistorical social constructs and generational determinants of health have resulted in Blacks dying younger and sicker than other racial and ethnic groups in America (Jones-Eversley & Ravenell, 2018; LaVeist, 1993). This further highlights the continued importance of documenting social demographics (i.e., Black population, gender, employment, education attainment, etc.), and area-level disparities in social conditions (i.e., incarceration, sentencing, bail, etc.).

Table 2

Selected Data Comparison from The Philadelphia Negro (19th Century) to Recent Philadelphia and National Data

	Philadelphia 1890	**Philadelphia Blacks 1890**	**Philadelphia Blacks 2010**	**United States Blacks 2010**
Population[a]	1,046,964	39,371	686,870	3,091,424
Arrest[b] (% of total for all races in that region)	49,148	3,167 (6.44%)	44,319 (66%)	2,846,862 (28%)
Five Leading Cause of Death[c]	Nervous System Diseases Tuberculosis Pneumonia Diarrheal Diseases Heart Disease	Tuberculosis Nervous Diseases Heart Disease Pneumonia Infant Mortality	Heart Disease Cancer Cerebrovascular diseases Unintentional Injuries Assault	Heart Disease Cancer Unintentional Injuries Stroke Homicide
Mortality Rates[d]	23.3 (per 1,000)	32.42 (per 1,000)	1,039 (per 100,000)	898.2 (per 100,000)

Note. [a]2010 US: Population: https://www.census.gov/prod/cen2010/briefs/c2010br-06.pdf
[b]2010 US: Arrest rates https://ucr.fbi.gov/crime-in-the-u.s/2010/crime-in-the-u.s.-2010/tables/table-43; 2010 Philadelphia: Arrest rates retrieved from http://www.paucrs.pa.gov
[c]2010 US: Leading Cause of Death https://www.cdc.gov/healthequity/lcod/men/2010/LCODrace_ethnicityMen2010.pdf; 2010 Philadelphia: Leading Causes of Death from http://www.phila.gov/health/pdfs/2010VitalStatisticsReport.pdf
[d]2010 US: Black Mortality Rate: https://www.cdc.gov/nchs/data/nvsr/nvsr61/nvsr61_04.pdf; 2010 Philadelphia: Black Mortality Rate from http://www.phila.gov/health/pdfs/2010VitalStatisticsReport.pdf

The Philadelphia Negro study is just one indication of Du Bois' contributions to epidemiology since his literary contributions (e.g., books, essays and articles) exceed a thousand scholarly works. His theoretical and conceptual premises (such as race theory, double consciousness, etc.) are well-documented (Gooding-Williams, 2018; Mostern, 1996; Zuckerman, 2004). Du Bois' contributions remain underappreciated in peer-reviewed research literature and published books in epidemiology and social epidemiology as seen by the fact that of the 2,408 citations of *The Philadelphia Negro* appearing in a Google Scholar search in May 2018, only 164 featured the keyword epidemiology, and that number drops to 42 for social epidemiology. Furthermore, in contrast with his contemporaries, Du Bois was ahead of his time by including racism as a fundamental cause of disease (Phelan & Link, 2015; Williams & Collins 2001) and how discrimination precedes working

and living conditions, which his contemporaries were framing as the root causes of disease. This focus makes Du Bois a true founding father of *social* epidemiology, since he focused on social factors as fundamental causes of disease. While others focused on class differences nearly exclusively, Du Bois' work was on the intersection of race and class, immigration, and gender (Williams & Sternthal, 2010). This critical gap in the public health research connects and explains the variances in health and health care among racial and ethnic groups (Gilbert & Dean, 2013). Unfortunately, health disparities among groups facing long-term oppression are often overlooked in some sections of social epidemiology research, such as social capital and health research (Dean & Gilbert, 2009). Du Bois' comprehensiveness and inclusivity of the many social factors as fundamental causes of disease earns him a rightful place as a founding father of social epidemiology.

WHAT DOES DU BOIS' LEGACY LEAD US TO DO DIFFERENTLY NOW?

Du Bois' work continues to offer lessons for social epidemiology, and in designing the future way forward for social epidemiology as a field. First is for the field to acknowledge Du Bois as a founding father and look back on his work to show how health has and has not changed over time, so that we can act with that knowledge toward a better future (e.g., Sankofa). Sankofa is an African philosophical term and phenomenon that recognizes the enslavement of Blacks during the Diaspora and encourages cultural behaviors and consciousness of *looking back and thinking forward* for a healthy and solution-focused future (Gamble, 2009; Temple, 2010). To explore the Sankofa philosophy, we consider Galea and Link's (2013) guiding framework of six paths for moving social epidemiology science forward and offer brief examples of how Du Bois' work applies.

The first path of moving forward that Galea and Link mention is to *focus on macro-level determinants of population health*. In focusing on racism and social exposures of inequality as drivers of health, disease, and mortality, Du Bois laid the foundation for future social determinants work in health and mortality disparities. Du Bois' work helps one consider some of the larger forces of discrimination at work on health, such as recent work focusing on Jim Crow laws and increased breast cancer risk (Krieger, Jahn & Waterman, 2017) and reductions in infant death after the abolition of Jim Crow laws (Krieger et al. 2013). Du Bois' work helps point to the second pathway forward, *methodological innovation*, by reinforcing the need for intersectional approaches that consider the multiple oppressed identities that racial/ethnic minorities and foreign-born residents face, calling for new methods for accounting for the health influences of these identities (Asad & Clair, 2017; Jackson, Williams, & VanderWeele, 2016). Third, *understanding mechanisms*, as informed by Du Bois' methods, would employ greater use of qualitative and quantitative mechanisms for how large-scale social and political factors influence the health of populations and point to how to address disparities seen today. Fourth, *social interventions* that could be studied might include decriminalization policies, changes in sentencing and bail, and changes in neighborhoods. In the same way that Du Bois dared to consider that intervening on exposures outside of health could improve health problems, current public health practitioners should consider the same. Fifth, investigating the *central role of intergroup differences and inequality* includes documenting differences and populations that may not otherwise rise to attention. Du Bois demonstrated intergroup variances and inequality in *The Philadelphia Negro* when he examined urban Blacks, and currently and formerly incarcerated populations (Elo, 2009). Work documenting the mental health of those who are imprisoned, for example, has not been responsive to changes in policies and social conditions that have contributed to the rise of those in prisons, nor has it ensured systematic definitions or mental health screenings for those in prison (Prins, 2014). A lack of attention to the health of those who have been or are currently incarcerated is a disservice, given that a disproportionate share of Black men, and increasing numbers of women and low-income White men are in the prison system. Du Bois laid the foundation for this by identifying the intersecting social forces contributing to these challenges, many of which still need to be addressed today. Sixth, to move forward, it is critical that the methodologies of social epidemiology

concentrate on *theory and the health of populations*. This means making greater scientific investments in exploring the infectious social exposures and social factors that Du Bois highlighted, in order to meticulously identify the fundamental causes of disease and death. This is especially important as the precision medicine movement moves forward. The precision medicine movement analyzes patients' genes, behaviors, and environment when developing the best treatment options (Juengst et al., 2016). But the precision medicine movement runs the risk of leaving behind medically fragile and marginalized populations who may not be equally represented in the underlying research or application of precision medicine (Bayer & Galea, 2015).

W.E.B. Du Bois as a Founding Father of Social Epidemiology

For far too long, and as explained by critical race theory, the validation of Black research and the scholarly brilliance of Black researchers like W.E.B. Du Bois has been underappreciated (Genovese, 1970; Record, 1957). Universally, the health of humans is too valuable to racialize the validity of groundbreaking research that substantially contributes to research, policy, programming and practices. Du Bois' study should not be narrowly viewed by its intraracial or interracial components. His study's translational value is both multicultural and global. We are nearly decades into the 21st century, and it cannot be overemphasized how vital it is to examine health and health care through a transdisciplinary lens (Schneiderman & Speers, 2001). The field of social epidemiology must globally recognize the revolutionary epidemiological, social, and spatial contexts of the *Philadelphia Negro*, and how it illuminated the social exposures of racism due to systemic inequalities intersects with health risks and determinants of death.

John Snow's 18th century research was globally acknowledged and when correlations between the agent-environment were discovered the cholera outbreak ceased. More important, his epidemiological methodologies were acknowledged, and they continue to save lives when medical exposures are identified in a community or geographic area. Du Bois' contributions were not similarly widely recognized when he demonstrated relationships between the social environment and Black morality which, most immediately**,** became the foundation for a series of reports published by the 11th Atlanta University Conference Proceedings toward improving knowledge of sanitation and preventive medicine for Black peoples (White, 2011). In the long-term Du Bois' work opened the gates for social epidemiologic work that explicitly names and focuses on intervening social factors as the root causes of disease; for research on intersectionality; for attention to the health of marginalized and institutionalized populations; and for the work on race-based health disparities that continues to save lives. In the same way that John Snow is credited with re-defining the root cause of disease, Du Bois redefined the causes of disparities as social. He did so with a comprehensive lens that included systems of racial oppression that was absent in previous foundational work of his predecessors and contemporaries. The *Philadelphia Negro* study not only embodied the six key principles of modern day epidemiology research, but retrospectively, it modeled the six pathways for the future of social epidemiology as well. Yet, the full value of Du Bois' 19th century research work to the field of epidemiology has not risen to the level of recognition or eminence it deserves.

After over 121 years, to finally acknowledge Du Bois as a founding father of social epidemiology is an important re-orienting step for the field that can strengthen science by an increasing attention on the past and present social, political, environmental, and economic factors that influence health. The systemic inequality of racism is an infectious epidemic and social epidemiology must play a critical role in decreasing and eliminating its infectious societal impact in America and around the world. Revisiting Duboisian research and modeling Du Bois' social epidemiological methods when studying racial and ethnic health disparities is globally needed to affirm the universal right to health and well-being for all human beings. Reflecting upon the comparative morbidity and mortality rates of Philadelphia Blacks in 1890 and 2010 prompts the Sankofa wisdom of:

- looking back at *The Philadelphia Negro*,
- thinking forward by embracing social epidemiological research to examine the social inequalities, and
- acknowledging W.E.B. Du Bois' revolutionary contributions to social epidemiology.

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