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Review

Trends in mortality from skin diseases in the United States: skin infectious diseases are claiming more lives

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Abstract

Background
Although there has been some excellent work published on the mortality from non-neoplastic skin disease In the United States, further analysis of trends is limited.

Methods
Data from the Centers for Disease Control and Prevention (CDC) for mortality abstracted from Death Certificates was obtained from the WONDER (wide-ranging online data for epidemiologic research) system from 1999 to 2014. Categorical variables were analyzed with Excel 2013 data analysis software using Chi-squared tests whereas regression was performed for trends.

Results
Crude death rates were highest in the South, especially in Mississippi and Louisiana. This work also confirmed that Blacks or African Americans had higher risk of death from skin disease, whereas Hispanic or Latinos had lower risk. Overall mortality from non-neoplastic diseases is increasing over time and significant increases in mortality from infectious and papulosquamous diseases were observed, whereas there appears to be decreasing mortality from dermatitis and miscellaneous skin disorders (ICD-10-CM L80-90).

Conclusions
Mortality is increasing from non-neoplastic diseases, especially infectious and papulosquamous diseases. Demographic factors such age race and Hispanic or Latino ethnicity also confer differential risk.

Introduction

Most dermatologic diseases affect quality of life, but are not life-threatening. Yet mortality from skin diseases, including non-neoplastic disease does occur. Lott and Gross published United States (US) mortality data up to 2009 obtained from the CDC WONDER system identifying the most common causes of mortality from these conditions as well as demographics associated with higher risk profiles [1]. No other information similar to this has to date or since been published. Two additional years of data are now available for analysis and these data may also be amenable to analysis for trends.

This manuscript builds upon earlier work, but will focus on time-trends of mortality. Specifically, are there remarkable increases or decreases in mortality over time from specific skin conditions? Are there other patterns of risk of mortality that are notable that can help us form policy decisions? This manuscript explores the updated available data.

Methods

Data from this study were made available on the CDC WONDER system for mortality in the US from 1999 to 2014. The CDC WONDER data for deaths is based upon nationwide death certificate provided directly to National Center for Health Statistics by state governments. Detailed documentation is available on the website: http://wonder.cdc.gov/wonder/help/ucd.html# [2]. Date of death, demographic information, cause or causes of death, place of death, and other information is available for all recorded deaths in the United States. Age-adjusted and other demographic-adjusted mortality rates were based upon the known population in demographic categories. This analysis was limited to ICD-10 codes of L00 to L98, which represent diseases of the skin and subcutaneous tissues. Many non-neoplastic diseases of the skin are not included in this category, such as herpes virus infections and other infectious diseases. Nevertheless, this analytic subset captures a large number of skin diseases.

Results

Over the study period from 1999 to 2014, there were 64,554 deaths from non-neoplastic skin diseases of a total 39,458,188 deaths, or 0.164% of the total causes of death in the US. This corresponds to a crude death rate of 1.347 per 100,000 in the population.

Geographically, deaths from skin diseases were more common in the Eastern and especially the Southern US (Figure 1). Rates were the highest in Mississippi and Louisiana.

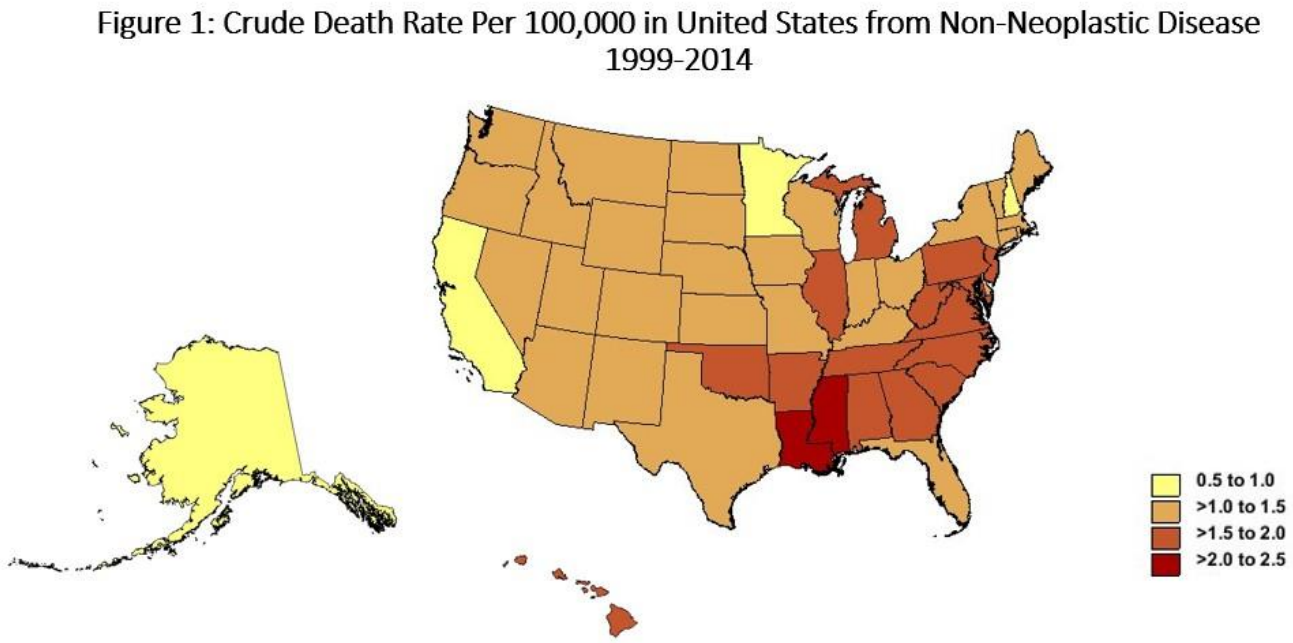

Figure 1. Mortality rates are the highest in Louisiana and Mississippi, and the lowest in Alaska and Minnesota.

Although the numbers of deaths from non-neoplastic skin disease are much higher in whites than other races, crude death rates were significantly ($p<.001$) higher for black or African Americans (2.05/100,000), and lowest for Asian or Pacific Islander Americans (0.43/100,000). Figure 2 depicts the total deaths and rates by race (Figure 2).

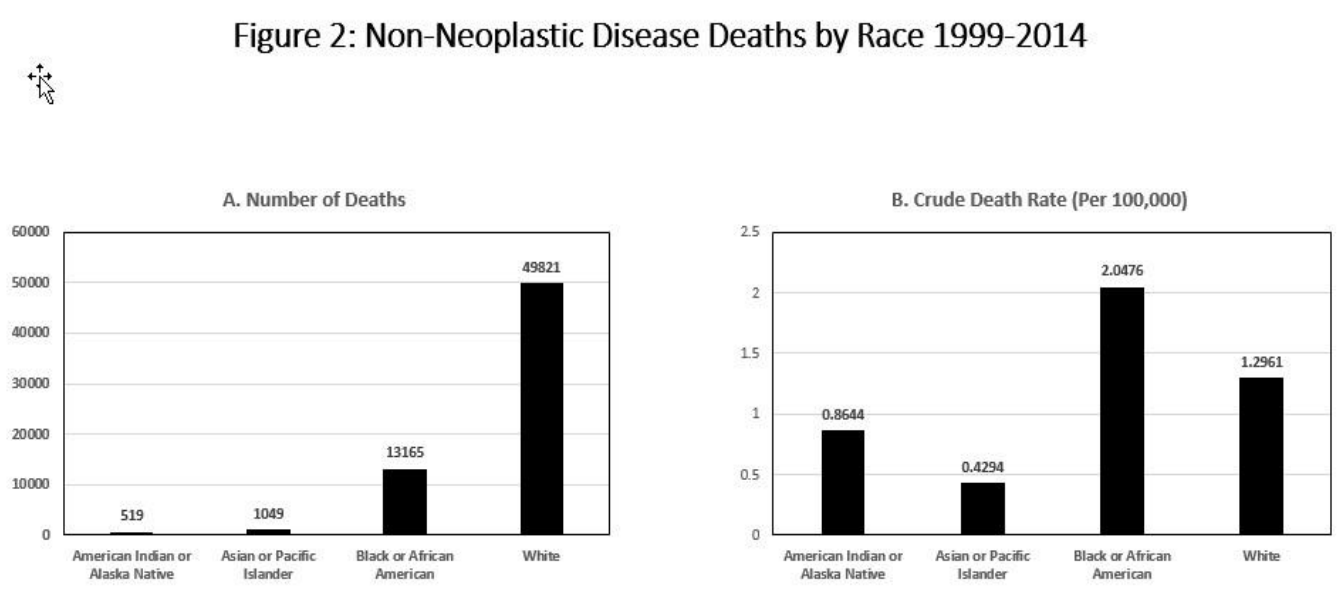

Figure 2. Blacks or African Americans have the highest mortality rate, whereas Asians and Pacifica Islanders have the lowest.

At all age groups from 35 to 44 years and older, Hispanic or Latino Americans had a lower non-neoplastic skin disease (p<.001) mortality rate (0.5/100,000) than non-Hispanic or non-Latino Americans (1.5/100,000). Figure 3 presents the increased risk of death as age increases, and dichotomizes into these ethnicity designations (Figure 3).

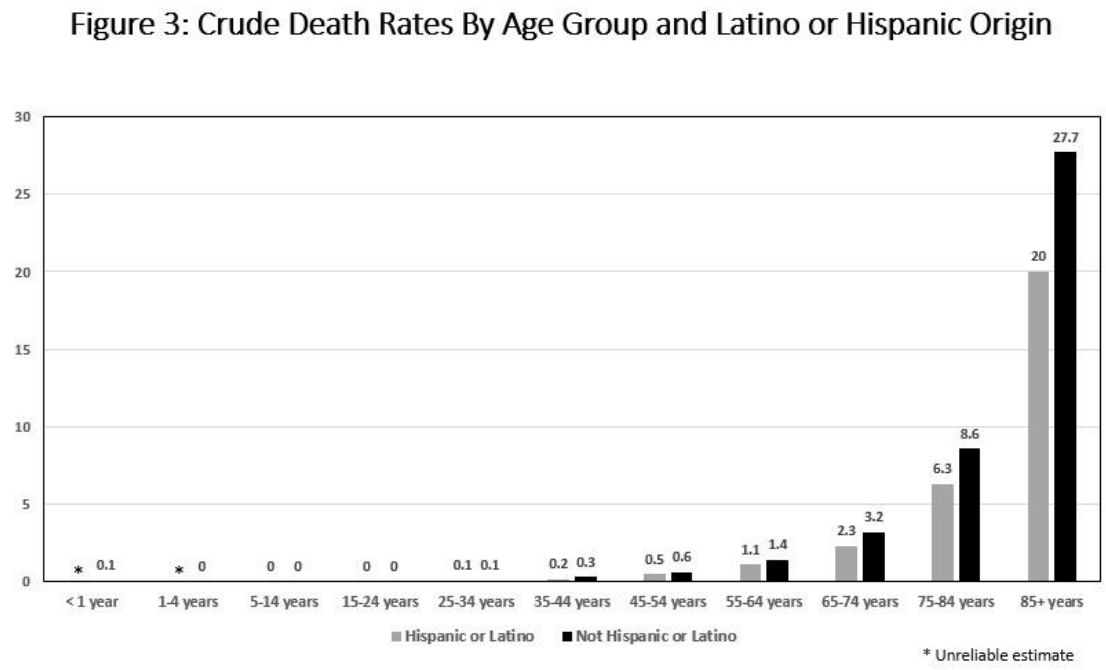

Figure 3. Death rates rise strikingly with age, but are always lower for Latino or Hispanic Americans.

Figure 4 depicts yearly trends in mortality. Although the yearly number of deaths from all non-neoplastic skin diseases in the US has significantly increased since 1979 (p<.001), the crude rate risk of death has not increased (p=.8). During this time, the population has increased from 279 to 319 million.

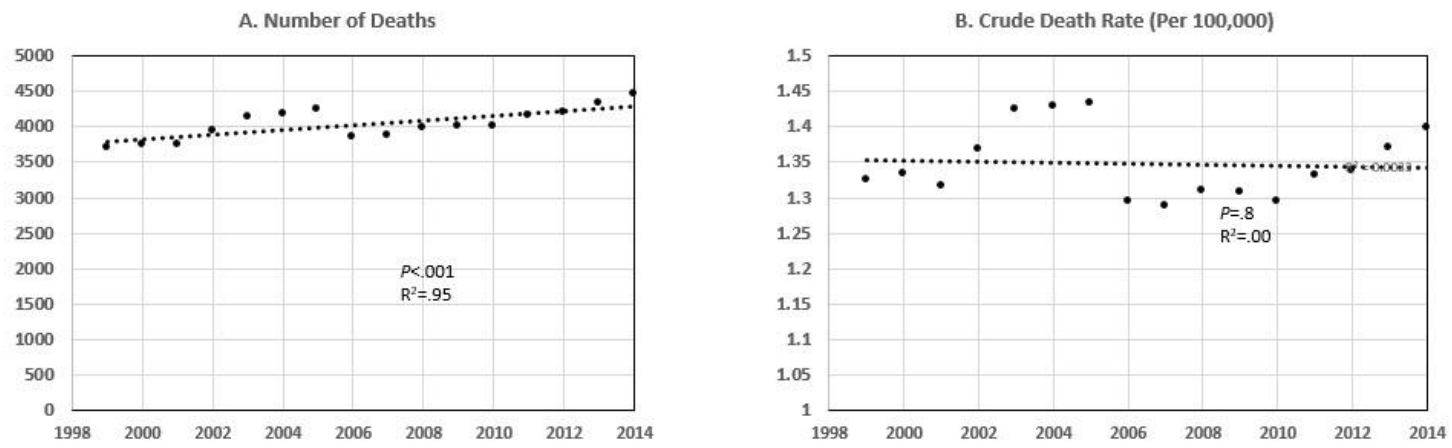

Figure 4. The deaths recorded from nonneoplastic disease is rising, but because of the expanding population, the death rates are not increasing.

Women and men differ in their mortality from skin disease. Over time, the mortality rate of women appears to be declining, whereas the mortality rate of men is increasing (Figure 5).

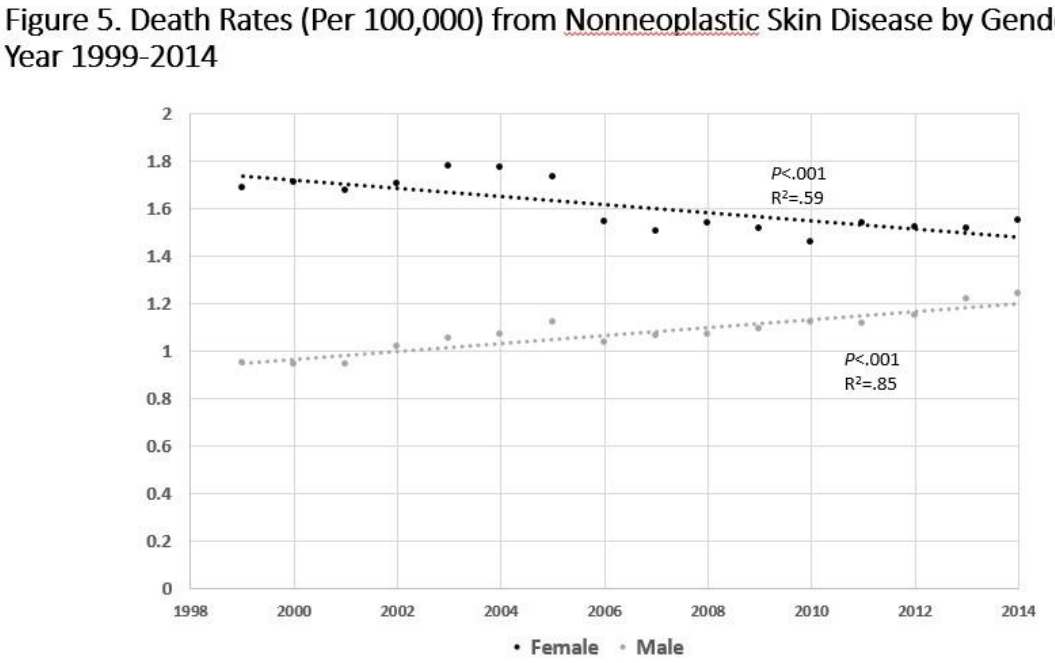

Figure 5. Men and women differ in their risk of mortality from nonneoplastic disease, but this difference is narrowing over time.

Trends in absolute mortality numbers were analyzed for all diagnostic subsets in this study. Figure 6 depicts the four most common ICD-10 subset causes of death. Not depicted in Figure 5 are the diagnostic subsets of dermatitis and eczema, which showed a significant decline in the absolute number of deaths over the study period (p=.03), but the % of the yearly rate estimates were so low as to be unreliable in the last decade of analysis, so further exploration into the rate change could not be performed. No trend analysis could likewise be performed for radiation disorders or for disorders of hair appendages since the numbers were so low. Although the numbers of affected people were small, the population rate of mortality from papulosquamous disease is increasing (p=.05) over the study period.

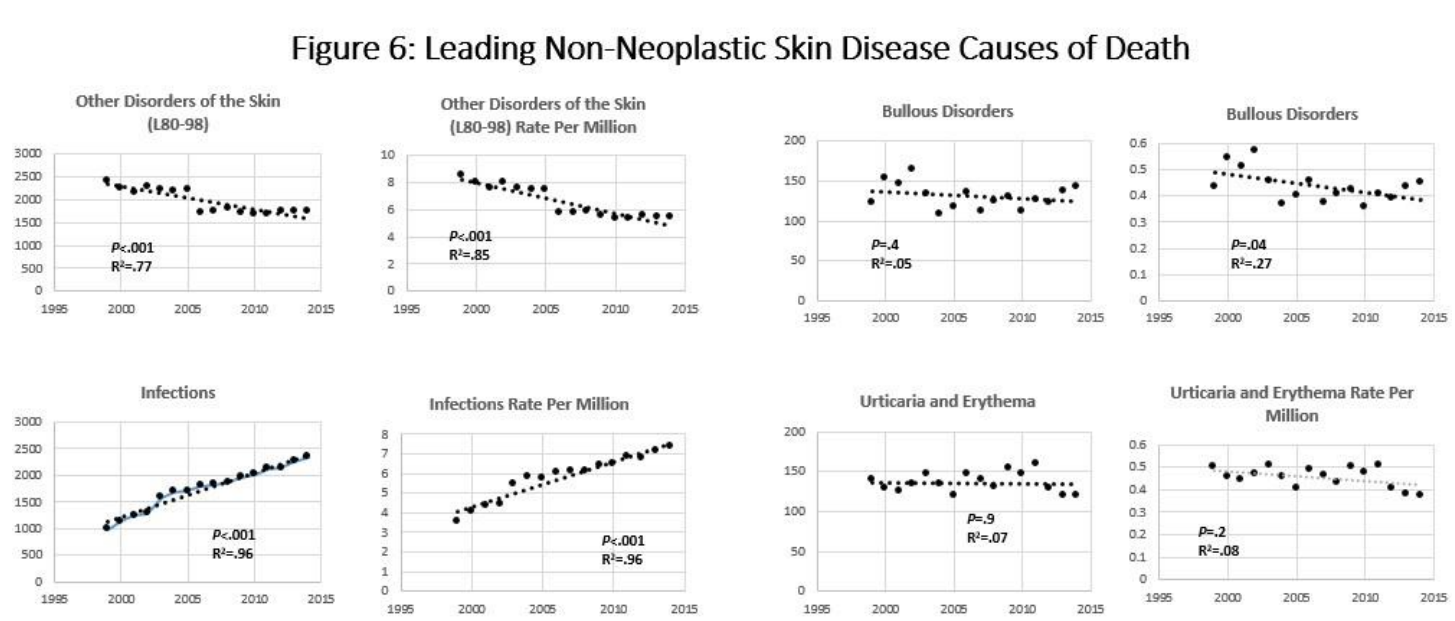

Figure 6. Significant increases in numbers and rates of death are noted for infections, whilst decreases are noted for other disorders of the skin (L80-92) and bullous disorders.

A detailed enumeration of the individual ICD-10 causes of death is found in Table 1. Many of the specific diagnoses have rates sufficiently low as to be unreliable. Nevertheless, these numbers and rates are recorded here.

Discussion

This reports brings us up to date regarding mortality numbers, rates, and trends. Several comments will highlight the most important findings. This manuscript seeks to present the results in objective fashion, and limited comments on the interpretation will be presented.

First, the distribution of mortality rate by state varies considerably, as does the risk by race. This confirms earlier published findings by Lott and Gross, [1] who note that blacks or African Americans have a greater tendency of living in Southern states. Health disparities do exist in the United States [3], and differential mortality rates by race and geography are noteworthy. Socioeconomic status and race are linked and at least some of the observed racial and geographic mortality differences likely relate to this factor. [4] No information on socioeconomic status is available from this analyzed dataset.

The older one's age, the greater the risk of death by non-neoplastic skin disease. Being of Latino or Hispanic ethnicity significantly reduces the risk of mortality from these diseases from middle age onwards. This could represent a reporting bias, but the consistency suggests there may be a valid association. Others have written about observed differences in mortality among Latino or Hispanic Americans [5,6,7]. Person and colleagues note lower rates of infectious disease deaths in Latino or Hispanic infants in the United States [5].

Although this report finds that the numbers of deaths in this disease category are rising, the overall mortality rate is not changing. Men and women, however, appear to differ in their risk of mortality and the difference over time likewise appears to be narrowing.

This paper also notes declines in the rates of death from bullous disorders, and "other disorders of the skin (ICD-10 L80-98),” whereas significant increases in the rate were noted for infectious diseases and papulosquamous diseases. Because of the large numbers of deaths from infectious diseases (28,005 over the study period) compared with the small number of papulosquamous deaths (606 over the study period), this may represent a worrisome trend. There may be many reasons for increased risk of mortality from infectious diseases, but changes in antibiotic resistance among pathogenic bacteria are well-recorded [8,9]. Nearly one hundred (84) additional deaths occur each year over the study period.

From a broader perspective, Boyers and colleagues in 2014 published global data on mortality from skin conditions [12]. This group looked at all causes of skin-related mortality. In developed countries such as the United States, mortality from skin cancer was much higher than in developing countries, whilst infectious diseases were less likely to cause mortality. Interestingly, they report that mortality in developed countries is declining in select infectious diseases from 1990 to 2010. Although the study time-

frame differs, combining and analyzing data from 187 countries is less likely to be as thorough and complete as a comparable analysis from a single country. The present study did not limit itself to a select, few infectious diseases prevalent worldwide.

Limitations of this study are many, and the largest limitation is the accuracy of death certificate diagnosis. Although death certificate data are widely available and used for research purposes, errors in recording the cause of death occur systematically. Kirtcher and colleagues found that there was a 29% rate of disagreement with the death certificate compared with the autopsy results [10]. Although the above autopsy study was 30 years old, more recent findings by Ravakhah confirm these results [11]. For instance, we must question the recorded causes of deaths from yellow nail syndrome (32), lichen simplex chronicus (7), and corns and callosities (3). By contrast, recorded deaths from decubitus ulcers (22,000) are more likely to be correct. Nevertheless, these are the best data that are available for analysis and readers should exercise some caution in the interpretation.

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Author Contributions
Dr. Fleischer had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. The entire work was completed by Alan Fleischer, including: Study concept and design, Acquisition, analysis, and interpretation of data, Drafting of the manuscript, Critical revision of the manuscript for important intellectual content, Statistical analysis, Obtained funding, Administrative, technical, or material support and Study supervision.

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Dr. Fleischer serves as a consultant to Kikuka America International. He was formerly an investigator for Galderma, Regeneron, AbbVie, and Eli Lilly. He was formerly an Employee of Merz North America. He has no other potential conflicts including Honoraria, Speakers bureau, Stock ownership or options, Expert testimony, Grants, Patents filed, received, pending, or in preparation, Royalties, or Donation of medical equipment