Blood Pressure and Interpersonal Discrimination: Systematic Review of Epidemiologic Studies

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Abstract

The relationship between blood pressure and discrimination has been recently investigated, and there are conflicting debates in literature devoted to the topic.

The objective of this study was to update previous literature reviews on discrimination and blood pressure.

A bibliographic search was conducted in PubMed between January/2000 and December/2010, including epidemiological studies, assessing the relationship between interpersonal discrimination and blood pressure/hypertension.

The 22 studies included originated from the United States; 96% of them used the cross-sectional design with convenience sample, comprising, in 59% of the studies, exclusively Black participants. The Everyday Discrimination Scale and the Perceived Racism Scale were the most frequently used instruments, emphasizing lifetime or chronic/everyday racial/ethnic discrimination. In the 22 studies assessed, the association between discrimination and blood pressure/hypertension was assessed 50 times. Twenty results (40%) showed no association between them, and only 15 (30%) revealed global positive associations, of which 67% were statistically significant. Eight negative associations were also observed, suggesting that higher exposure to discrimination would be associated with lower blood pressure/hypertension.

The studies did not consistently support the hypothesis that discrimination is associated with higher blood pressure. These findings can be partially attributed to the limitations of the studies, especially those related to the measurement of discrimination and of factors that might modify its association with outcomes. To establish discrimination as an epidemiological risk factor, more rigorous methodological strategies should be used, and the theoretical frameworks that postulate causal relationships between discrimination and blood pressure should be reviewed.

Keywords

Blood pressure; prejudice; review; epidemiologic studies.

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Introduction

The relationship between discrimination and health has raised an increasing interest among public health researchers, who have carried out an increasing number of studies on the topic, especially in the last three decades[1]. Although the interest on the topic has grown, a terminological confusion still persists in the literature, with the terms 'discrimination' and 'racism' being frequently used interchangeably[2]. While discrimination refers to differential, and often unfair, treatment of people informally or formally grouped into a particular social category[3], racism refers to beliefs, attitudes and institutional regimens, which tend to disadvantage people or groups due to their ethnicity [or race][4].

Individuals who are discriminated against have their individuality threatened and their human rights violated. This phenomenon significantly impacts several areas of their lives, including health, where the effect usually manifests itself through the form of adverse outcomes, such as psychiatric disorders and the adoption of potentially pathogenic behaviors. According to Pascoe and Smart-Richman[5], discrimination may affect physical and mental health both directly and indirectly, increasing chronic stress levels or submitting individuals to increased risk of adopting deleterious health behaviors. For example, interpersonal racism[a] has been associated with risk factors for hypertension, being positively associated with excessive weight gain over time[5]. Discrimination has also been associated with greater propensity to alcohol abuse in other investigations[5-7].

Although adverse mental health conditions are consistently associated with discriminatory experiences[2], there is also an increasing interest in examining the relationship between discrimination, blood pressure, and hypertension[8], mainly through laboratory studies. Brondolo et al.[9], in 2003, reviewing studies on discrimination and blood pressure, concluded that the association between discrimination and cardiovascular diseases is more consistent, when compared with that observed for blood pressure. In addition, Brondolo et al.[9] and Williams and Neighbors[6], reviewing studies on the relationship between discrimination and hypertension, reported several methodological limitations, mainly related to the measurement of discrimination and to the scarcity of prospective cohort studies.

Brondolo et al.[9,10] concluded that discrimination may contribute to the development of hypertension through multiple mechanisms, such as psychological stress and

[a]The authors of the studies reviewed have used the terms racism and discrimination interchangeably, and that was respected in the present study.

consequent cardiovascular responses, which, according to Williams and Neighbors[6], have been demonstrated by several laboratory studies. There is also a suggestion that environmental factors may be important in the development of hypertension and high blood pressure, such as chronic stress associated with limited access to healthy food[10]. These authors emphasize the importance of identifying the means through which discrimination acts as a stressor or as a barrier against health promotion.

Given the social importance of discrimination, including its emergence in the area of health-related studies, this paper aimed at updating previous literature reviews[6,9,10] on discrimination, blood pressure and hypertension. In particular, unprecedented by previous works, the theoretical frameworks used by authors and the instruments adopted to measure discriminatory experiences are described. In addition, the following were also summarized: the populations studied, regarding their racial or ethnic groups; and the consistency and direction of the associations tested between discrimination and blood pressure/hypertension-related outcomes.

Thus, this study aimed at analyzing interpersonal discrimination as an epidemiological risk factor for hypertension or increased blood pressure, emphasizing the social determinants to which these health outcomes are submitted. Interpersonal discrimination is an isolated discriminatory act, performed by one individual against another, on the basis of personal prejudice[3].

Methods

An electronic search was conducted in the PubMed bibliographic database for the period between January 2000 and December 2010. A search query with controlled vocabulary from the MeSH thesaurus (Medical Subject Headings) was developed, such that the higher terms in their hierarchical trees, whose meanings related to discrimination and blood pressure, were used. Free terms were also added to increase the sensitivity of the search query, as follows: *("prejudice"[mesh] or "ethnic groups"[mesh] or "racism"[tiab] or "discrimination"[tiab]) and ("vascular diseases"[mesh] or "blood pressure"[mesh])*.

The search query resulted in 1,154 publications, and their eligibility was checked through the analysis of their titles, abstracts, and, when necessary, their full texts. The articles included in the review were epidemiological studies, which assessed self-reported interpersonal discrimination as the exposure, and the increase in the prevalence of hypertension or in blood pressure levels, measured both episodically and through ambulatory blood pressure monitoring (ABPM), as outcomes[11]. The studies reporting an increase in the prevalence of hypertension or in blood pressure levels were grouped, according to the following categories: (a) increase or smaller reduction in blood pressure; (b) increase in mean blood pressure; (c) increase in diastolic blood pressure; (d) increase in systolic blood pressure; and (e) hypertension. Studies assessing blood pressure by use of ABPM were grouped as follows: (a) increase in ambulatory diastolic blood pressure; and (b) increase in ambulatory systolic blood pressure.

The following studies were excluded from this review: those not assessing blood pressure change as the outcome; and those not referring to discrimination as an exposure factor. Thus, studies assessing, as exposures, concepts related to stigma and prejudice, but not to discrimination, were excluded. Experimental and laboratory studies or those published in idioms inaccessible to the authors, such as Swedish, were also excluded from this review.

Data extraction was carried out with a form specifically developed for this review (the form is available upon request from the authors). The form was previously tested in a sample of five articles by all the authors of this study, who discussed divergences that occurred during form completion, until a consensus could be reached and the form could be used uniformly. The following data of each included study were extracted: year of publication; country of origin; journal; sample size; sampling strategy; sex, age group, and racial/ethnic characterization of the participants; types of discrimination measured; instruments used; and the theoretical framework used to interpret the relations of interest.

The following were also recorded: direction of the association; its statistical significance; and the population group in which the associations between discrimination and blood pressure-related outcomes were tested. The direction of the association was classified as positive (directly proportional relations), negative (inversely proportional relations), and no association (the occurrence of the outcome does not vary according to the categories of exposure to discrimination). Directions of association were described for all cross tabulations and not only for those which were statistically significant. ($p < 0.05$). This allowed for the estimation of the proportion of statistically significant associations among all those evaluated in the original studies. Whenever possible, the associations that had been adjusted for confounding factors in multivariable regression models were considered.

Data extracted were typed only once, with the aid of the EpiData program, version 3.1, with automatic checks for consistency and amplitude – the resulting spreadsheet is available upon request from the authors. Analysis included the description of the abovementioned characteristics of articles by means of relative and absolute frequencies. The direction, statistical significance, and the population group in which the associations were tested were shown in a contingency table. All analyses were performed using the Stata, version 11.1 software.

Results

This review included 22[12-33] original studies, all conducted in the United States of America (USA) (Table 1). Most studies (77%) were published between 2006 and 2010. Half of the publications had more than four authors. *Health Psychology* and *Annals of Behavorial Medicine* were the journals with the greatest number of included studies (three papers each). Almost all studies adopted the cross-sectional design and convenience sampling schemes. Only two studies differed with regard to these aspects: one was a cohort study, and the other used census as a method of participant recruitment.

Regarding the sample sizes (Table 1), 12 of the 22 studies recruited between 100 and 1,000 individuals. In relation

Table 1 - Bibliographic and methodological characteristics of the studies included in the literature review. Bibliographic database PubMed, 2011

Characteristics	N	%
Year of publication		
2000-1	1	4.6
2002-3	1	4.6
2004-5	3	13.6
2006-7	8	36.3
2008-9	4	18.2
2010	5	22.7
Authors per publication		
≤3	11	50.0
4-6	9	40.9
≥7	2	9.1
Journal		
Health Psychology	3	13.6
Annals of Behavioral Medicine	3	13.6
American Journal of Epidemiology	2	9.1
Other journals with one article each	14	66.7
Study's country of origin		
United States of America	22	100.0
Type of study		
Cross-sectional	21	95.5
Cohort	1	4.5
Selection of participants		
Convenience	21	95.5
Census	1	4.5
Sample size (participants)		
≤100	5	22.7
101 - 200	6	27.3
201 - 1000	6	27.3
1001 - 39000	5	22.7
Sex of participants		
Both	15	68.2
Female	5	22.7
Not informed	2	9.1
Age group of participants (years)*		
Adolescents (13-18)	-	-
Adults (19-64)	4	22.2
Elderly (65+)	1	5.6
All adult age groups (19+)	13	72.2
Racial/ethnic classification of participants		
Blacks	13	59.1
Latinos	2	9.1
Whites and Blacks	2	9.1
Multiple racial/ethnic groups †	4	18.2
Not informed	1	4.5
Total	**22**	**100.0**

**Information not available for four studies; †This category includes studies with (a) Blacks and Latinos, (b) Whites, Blacks and Hispanics, (c) Black and Latino immigrants, and (d) Blacks, Whites, Chinese and Japanese.*

to sex, 15 (68%) studies selected participants of both sexes, while five (23%) had only female participants. With respect to age, none of the studies included adolescents. One study assessed only elderly people, while, in four investigations, the sample comprised only adults. In the remaining studies (72%), participants belonged to all adult age groups (over 19 years). Regarding the racial/ethnic classification, most studies (59%) selected exclusively Black participants.

Table 2 shows that four studies used simultaneously two instruments to assess discriminatory experiences, while the others used only one. The most frequently used instrument was the *Everyday Discrimination Scale* (27%), followed by the *Perceived Racism Scale* (18%). Racial/ethnic discrimination predominated, and only in one study the instrument assessed unfair treatments due to any motivation. Regarding the exposure time frame, discrimination throughout one's lifetime (45%) and chronic daily discrimination (27%) were the most assessed. Of the secondary instruments used to assess the discriminatory experiences, the *Experiences of Discrimination* was the most used (50%). All four studies adopting two instruments simultaneously used them to assess chronic daily discrimination. In three of the four studies, the type of discrimination assessed was racial/ethnic discrimination, while one study assessed discrimination of non-racial motivation, that is, any other except racial.

Discriminatory experiences were studied in relation to seven different types of outcomes (Table 3). A total of 50 different results of the association between the outcomes studied and discrimination was assessed. In 20 results (40%), no association was observed. The direction of the association between discrimination and the outcomes most frequently observed was positive, not restricted to specific population strata (67% of them were statistically significant). Those associations indicated that higher reports of discriminatory experiences were associated with higher occurrence of the adverse outcomes assessed.

The most frequently studied outcome, with 15 tests of association, was the increase in systolic blood pressure, of which seven showed no relation to discrimination. However, the following associations were found: two global positive associations (50% statistically significant); three positive (100% statistically significant), but restricted to specific population strata (men and people with little social support); and three negative (100% statistically significant), conditional on determined population groups (individuals over the age of 40 years, individuals who accept discrimination as a *normal* fact in their lives, and individuals with no anger personality traits).

The second most studied outcome (13 association tests) was the increase in diastolic blood pressure, and seven results of these associations showed no relation to discrimination. However, five associations were found, as follows: two positive associations (100% statistically significant), but restricted to men and Blacks; and three negative (100% statistically significant), conditional on groups of individuals over the age of 40 years, not using antihypertensive drugs, and with no anger personality traits. In addition, for that last outcome, one statistically significant positive association was observed in the entire sample. Discrimination was positive and globally associated with the increase in ambulatory blood pressure (systolic and diastolic) in all studies assessing those outcomes, and 67% of the results were statistically significant.

The results regarding the increase or small reduction in ambulatory blood pressure showed two global positive associations, both statistically significant. Two other results showed no association. Hypertension showed four global positive associations with discrimination, and two of those associations were statistically significant. Three conditional associations were observed, all statistically significant, as follows: two positive, conditional on women (in one of the studies, that association was restricted to women born outside the USA); and one negative association, restricted to individuals who accept discrimination as a *normal* fact in their lives. A global negative association was also identified, but with no statistical significance. Three results showed no association of any direction.

Of the studies included in this review, 19 (86%) have cited at least one theoretical framework to interpret the relations of interest, of which 'the chronic stress emotion theory' was the most frequently mentioned. Briefly, the studies have reported that discrimination hypothetically leads individuals to a chronic psychological stress, individually and collectively perceived, which would cause changes in their physiological functions, such as an increase in cardiovascular reactivity and changes in baroreceptors. Consequently, the chronic stress due to discrimination would lead to an increase in systolic and diastolic blood pressures. Thus, the psychological strain due to discrimination would play a significant role in the prevalence of chronic diseases, such as hypertension, cardiovascular diseases, obesity and diabetes.

Discussion

Considering the results observed, the increased interest in studying the relationship between discrimination and blood pressure-related outcomes is recent, given that 77% of the studies assessed have been published from 2006 on. In addition, the studies tended to be published in journals, such as *Health Psychology* and *Annals of Behavioral Medicine*, which aim at investigating relationships between psychosocial and behavioral factors, such as discrimination, as well as aspects of physical health, health promotion, change in risk factors, and disease prevention.

All studies reviewed originate from the USA. That result can be explained, among other factors, by the vast scientific production of that country and by the importance that the topic 'discrimination' has in the North-American society, especially regarding the African-American issue[6]. Similarly, the interest in the study of the relationships between discrimination and blood pressure in other countries, even in European countries, where immigration has been a highly important population phenomenon in recent years, has been clearly incipient. In Brazil, similarly to what occurs in the USA, important factors related to the idea of race, racism, and discrimination also deserve to be more deeply studied to assess their relationships with health conditions and behaviors, particularly blood pressure.

However, considering that most discrimination scales have a North-American origin and emphasize, with rare exceptions,

Table 2 - Methods and instruments to measure discriminatory experiences in the studies included in the literature review. Bibliographic database PubMed, 2011

Studies using at least one instrument to assess discriminatory experiences			Studies using two instruments to assess discriminatory experiences simultaneously		
Methods and instruments	**N**	**%**	**Methods and instruments**	**N**	**%**
Scale for measuring discrimination			Scale for measuring discrimination		
Everyday discrimination scale	6	27.3	Experiences of discrimination	2	50.0
Perceived racism scale	4	18.2	Detroit area discrimination scale	1	25.0
Racism and life experiences scale	4	18.2	Everyday discrimination scale	1	25.0
Perceived discrimination scale	2	9.1	-	-	-
Other scales	4	18.2	-	-	-
No scale was used	2	9.1	-	-	-
Type of discrimination assessed			Type of discrimination assessed		
Racial/ethnic	21	95.5	Racial/ethnic	3	75.0
Unfair treatment due to any motivation	1	4.5	Non-racial	1	25.0
Cumulative exposure to discrimination			Cumulative exposure to discrimination		
Throughout one's lifetime	10	45.4	Chronic daily	4	100.0
Chronic daily	6	27.3	-	-	-
Last year	2	9.1	-	-	-
Last three months	2	9.1	-	-	-
Other exposures	2	9.1	-	-	-
Total	**22**	**100.0**	**Total**	**4**	**100.0**

Table 3 - Results of the association between discriminatory experiences and outcomes related to blood pressure in the studies included in the literature review. Bibliographic database PubMed, 2011

Outcome	Global association [a]		Conditional association [†]		Population strata in which conditional association was observed [†]	No association	Total
	Positive (% s.s.[‡])	Negative (% s.s.[‡])	Positive (% s.s.[‡])	Negative (% s.s.[‡])			
Increase or smaller reduction in blood pressure	2 (100.0)	- (-)	- (-)	- (-)	-	2	4
Increase in mean blood pressure	- (-)	- (-)	- (-)	- (-)	-	1	1
Increase in ambulatory diastolic blood pressure	3 (66.6)	- (-)	- (-)	- (-)	-	-	3
Increase in diastolic blood pressure	1 (100.0)	- (-)	2 (100.0)	3 (100.0)	Men; Blacks; non-users of anti-hypertensive drugs; individuals with fewer anger personality traits; individuals over the age of 40 years	7	13
Increase in ambulatory systolic blood pressure	3 (66.6)	- (-)	- (-)	- (-)	-	-	3
Increase in systolic blood pressure	2 (50.0)	- (-)	3 (100.0)	3 (100.0)	Men; individuals with little social support; individuals over the age of 40 years; individuals with fewer anger personality traits; individuals who accept discrimination as a normal fact of life	7	15
Hypertension	4 (50.0)	1 (0.0)	2 (100.0)	1 (100.0)	Women born outside the USA; individuals who accept discrimination as a normal fact of life; women	3	11
Total	**15 (66.6)**	**1 (0.0)**	**7 (100.0)**	**7 (100.0)**	**-**	**20**	**50**

[*] Global association is that observed in all individuals investigated, not restricted to specific strata; [†] Conditional association is that observed only in specific groups of the population studied; [‡]Proportion of the statistically significant (s.s.) associations (p-value < 0.05).

exclusively racial discrimination, the initiative of assessing that phenomenon in Brazil with the same instruments would necessarily conflict with extremely relevant issues. First, it is worth considering that the lay understanding of the concept of race in the USA differs considerably from the equivalent idea in Brazil, where, instead of race, the term 'color' tends to be more frequently used in racial classifications[34]. This distinction in the use of the expressions reflects that, in Brazil, aspects related to the appearance of individuals (phenotypes, physical features) are the major, but not the only, factors involved in what is usually called "Brazilian racial calculation", used to classify the population in the most varied circumstances and social interactions, including those of research. This emphasis on phenotypic characteristics or external physical features differs from what occurs in the USA, where the idea of origin or ancestry predominates, guiding the definition of socially constructed groups, such as Blacks or Whites[35].

Another important distinction in terms of racial attribution, but closely related to the manifestation of discriminatory behaviors, regards the existence of multiple subcategories of classification. On the one hand, there is the binary model, which does not predict expressive shades of skin color between black and white, and which predominates in the USA[36]. On the other hand, the Brazilian skin color continuum or gradient, which is based both on the attribution of social categorization to several shades of skin color and on different terminologies used to place, in a very particular way, individuals within a skin color spectrum, ranging from black to white[36].

In the social distinction attributed to several skin color shades between black and white, the skin whitening phenomenon in racial classification is also worth noting[37]. Considering the identification of the skin color groups with aspects of social class and *status*, there would be in Brazil a tendency towards Blacks and Browns experiencing improvement in socioeconomic conditions to be socially accepted as Whites. This bears close relation with the manifestation of discriminatory behaviors: considering that belonging to a certain color category depends on other aspects of social position, mainly socioeconomic *status*, certain individuals might not be discriminated against because of their socioeconomic status, and they may be socially recognized as Whites, although they present black skin, curly hair and other physical features related to the idea of Black race.

It is equally important to emphasize the peculiarities of racial discrimination in Brazil, as compared with the USA. While, in Brazil, the key concept to describe racial discrimination would be that of miscegenation, mixture or racial democracy, in the USA the equivalent term would be segregation[38]. In other words, while in Brazil racial discrimination manifests itself in conjunction with miscegenation/racial democracy, segregation, understood as physical and social distance between Blacks and Whites, is assumed as the underlying form of discrimination in the USA[38].

Briefly, the use of the term 'color', the existence of a skin color continuum and its relationship with socioeconomic *status*, and eventually the occurrence of miscegenation and of the myth of racial democracy all suggest that the North-American discrimination scales will hardly encompass these specificities. Thus, North-American scales will not be adequate for use in our context, unless adaptations pertinent to the measurement of Brazilian discriminatory experiences are made.

Beyond those questions, this review showed important methodological limitations in the original studies, some of which had already been identified in previous reviews[6-10]. Most of the studies adopted the cross-sectional design, with relatively small convenience samples, whose most participants were exclusively Blacks. The cross-sectional design is considered inadequate to establish temporal and cause/effect relationships, because it assesses risk factors and their outcomes at a single point in time. In addition, the exposure status assessed in a cross-sectional study might diverge from the previous exposure, making the identification of causal relations extremely difficult. There is still the aggravation that the reviewed studies used convenience samples, which are restricted to specific population groups, and the results found in these samples might differ from those observed in a larger population.

Another item worth noting is that most studies were carried out with samples of exclusively Black participants. This can be attributed to the fact that the authors of those studies have attempted to portray socioeconomic and psychosocial factors (such as discrimination) as the leading causes of the higher prevalence of hypertension in African-Americans, as compared to other population groups. Authors have attempted to contrast some still well-accepted theories that claim the existence of different races in the human population, attributing the greater prevalence of hypertension in the Black population exclusively to genetic factors. However, the studies should better assess the consequences of discrimination on blood pressure in other population groups, which are also subjected to intense and frequent forms of discrimination. This would show how discrimination potentially affects blood pressure in different population groups.

The scales most frequently used in the studies to measure the discriminatory experiences were *Everyday Discrimination Scale* and *Perceived Racism Scale*. Those scales have shown to be appropriate for that type of study, because they allow not only assessing the perception of discriminatory experiences, but also the frequency with which they occur. An important aspect to observe is that, although the *Everyday Discrimination Scale* allows measuring different types of discriminatory experiences, the studies have assessed exclusively racial/ethnic discrimination. Future studies should also assess the consequences on blood pressure of other types of discrimination, such as sex and class discrimination. This would allow a better assessment of racial/ethnic discrimination, comparing it with results referring to other types of unfair treatment.

The associations between discriminatory experiences and blood pressure-related outcomes seemed controversial, as follows: in 40% of the results, no association was found, while a global positive association was found in only 30% of the tests (15 results), only 67% of them being statistically significant. In addition, a relatively expressive number of inverse associations was found (eight, 16% of the results), most of which in specific population groups. That inconsistency in results had already been detected in previous reviews[2,6,7,9,10], and can be partially attributed to the methodological limitations of the studies already mentioned.

Conde and Gorman[39], assessing studies led by the researcher Nancy Krieger, have also reported inconsistencies in the findings regarding the relationship between discrimination and adverse health outcomes, such as blood pressure. According to those authors, such inconsistencies would be due to problems in the way discrimination is measured and classified in the studies. When assessing the scale of Krieger et al.[40] (*Experiences of Discrimination*), Conde and Gorman reported that, among other problems, that scale does not differentiate between the type, duration and intensity of the discriminatory events assessed.

Finally, Townsend et al.[41] have suggested that the inconsistencies among studies can be partially explained by the different worldviews of their participants. According to those authors, members of stigmatized groups who believe the *status* system is fair, while interacting with a prejudiced partner, tend to present adverse health outcomes, such as increased blood pressure. In contrast, members of stigmatized groups who believe the *status* system is unfair, while interacting with a prejudiced partner, do not show adverse health effects. Such that the absence of discriminatory behaviors in specific situations may be more threatening than its presence. This can explain the lack of associations or inverse associations found in the studies reviewed. Similarly, this can mean that the participants' worldview (fair *versus* unfair, for example) should be considered an important factor in theoretical models that postulate cause-effect relations between discrimination and blood pressure/hypertension.

Conclusions

This review was aimed at assessing discrimination as an epidemiological risk factor for hypertension, and also at updating previous reviews on the topic. It is worth emphasizing, however, that the restriction to PubMed might have had important implications to our results, such as the finding that all studies on discrimination and blood pressure originated exclusively in the USA. Thus, the results and conclusions of the present review should be regarded carefully, avoiding generalizations to studies from other databases or even to studies not published in scientific journals.

Nevertheless, in conclusion, to consolidate interpersonal discrimination as an epidemiological risk factor for hypertension or high blood pressure, studies should use more rigorous methodologies, with prospective cohort designs and larger samples. In addition, the current theoretical models should be reviewed, participants of different racial/ethnic groups should be recruited, and more accurate instruments should be used to measure discrimination regarding time, types and frequency of exposure. This would allow a more accurate assessment of the importance of discrimination for blood pressure and its dependence on other psychosocial and socioeconomic factors.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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