Vitamin D and Cancer Associations among Racial and Ethnic Minoritized Groups: a scoping review

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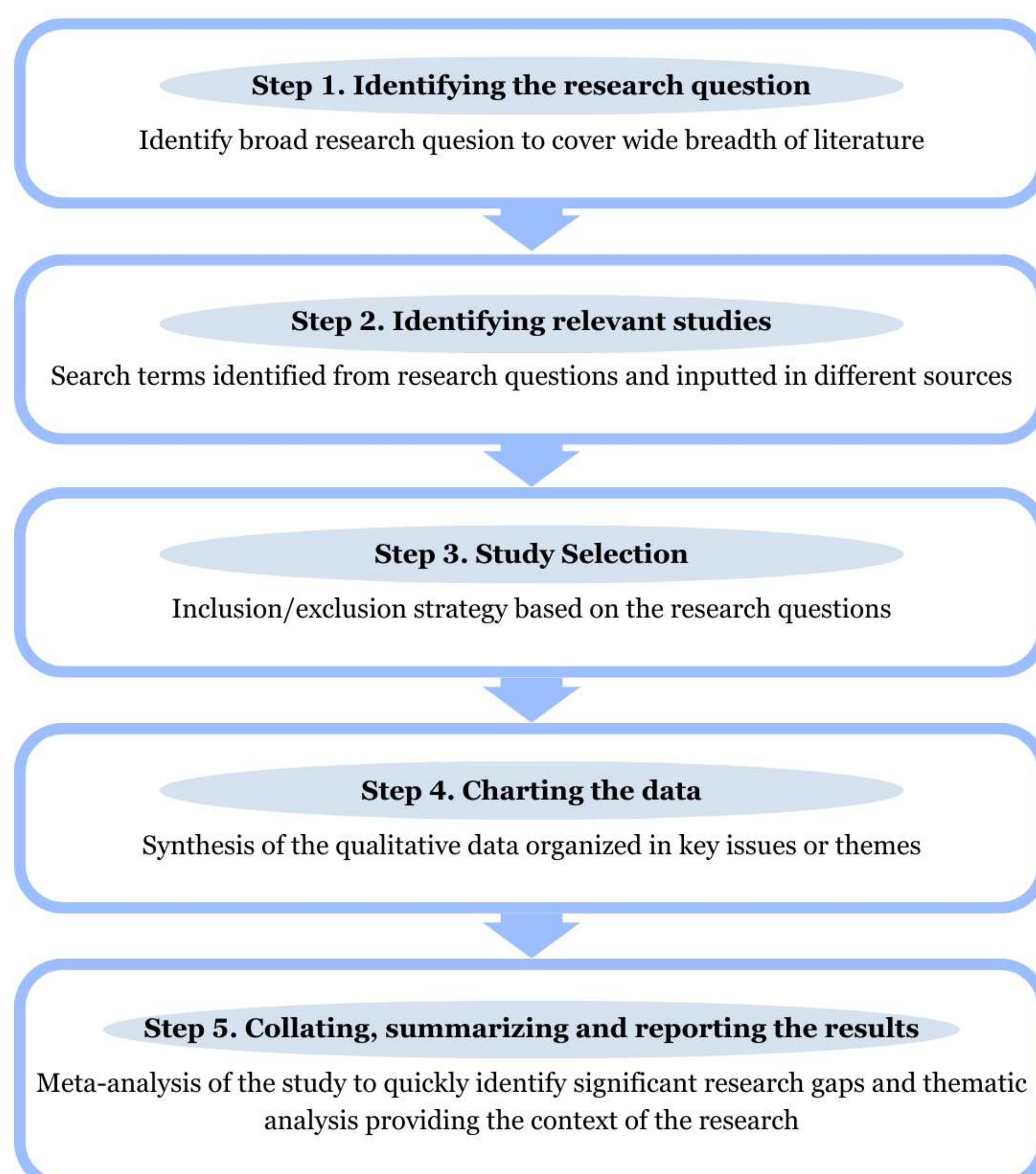
Background

- Racial and ethnic (r/e) minoritized groups suffer disproportionately higher cancer incidence and mortality rates, as well as deficiencies of serum vitamin D (25-hydroxyvitamin D; 25(OH)D) levels (Mondul, 2017).

- The state of the current epidemiological research on the associations between vitamin D levels and cancer outcomes for diverse racial/ethnic groups is unknown.

- Findings of vitamin D and cancer associations are mixed due to varying data collection methodology, potential biases, and lack of overall research.

Purpose

- This scoping review offers critical insights into the complex interplay between r/e groups, vitamin D status, and cancer diagnosis, aggressiveness, or mortality.
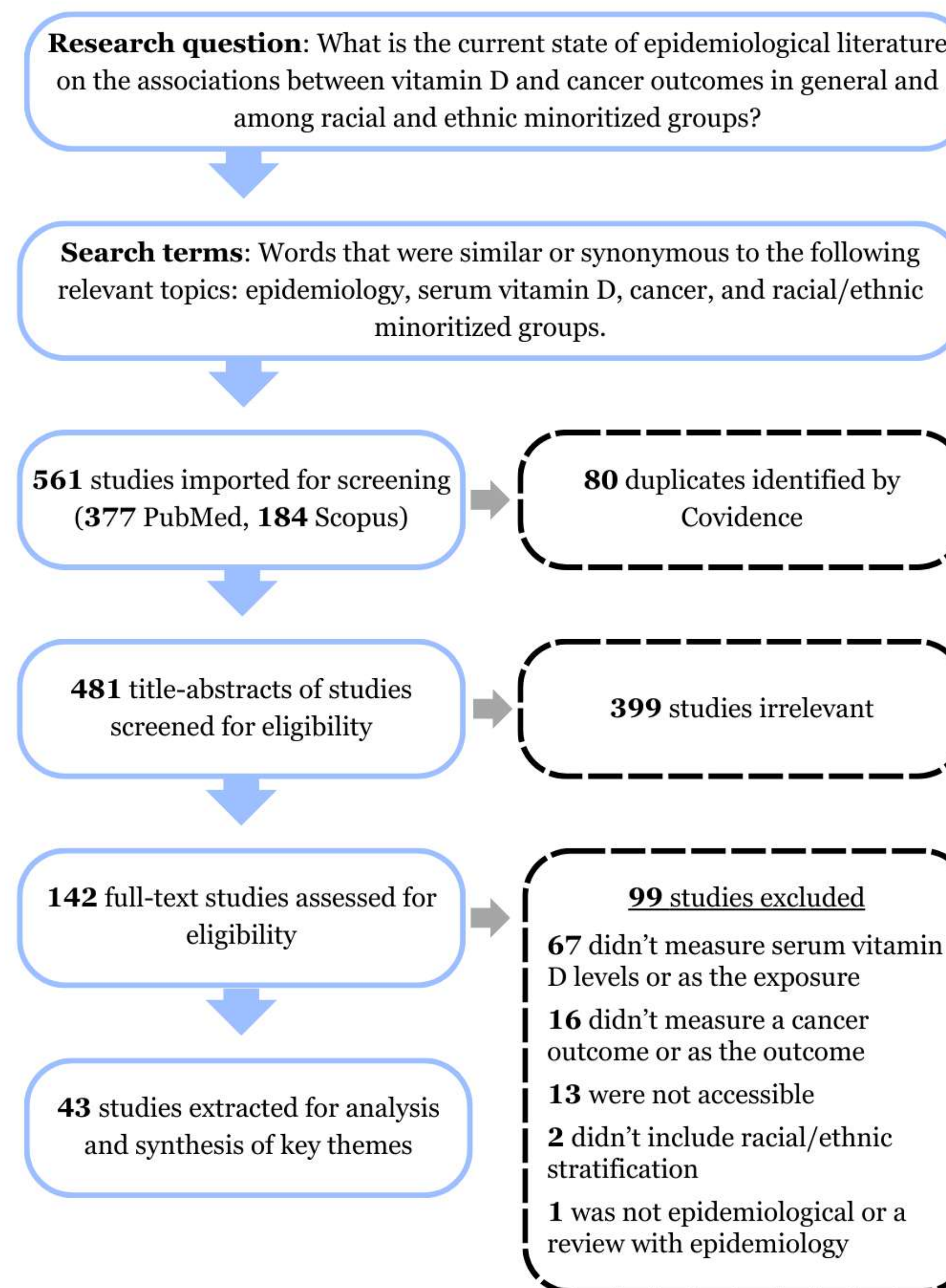
Methods

- This scoping review follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping reviews (PRISMA-ScR) and the Arksey and O'Malley's framework (2005).

- It utilized Covidence for stages 1-3 and Microsoft Excel for stages 4-5 as described in Figure 1.

Step 1. Identifying the research question
Identify broad research question to cover wide breadth of literature

Step 2. Identifying relevant studies
Search terms identified from research questions and inputted in different sources

Step 3. Study Selection
Inclusion/exclusion strategy based on the research questions

Step 4. Charting the data
Synthesis of the qualitative data organized in key issues or themes

Step 5. Collating, summarizing and reporting the results
Meta-analysis of the study to quickly identify significant research gaps and thematic analysis providing the context of the research

Figure 1. Scoping review stages summarized from Arksey and O'Malley (2005).

Findings

Research question: What is the current state of epidemiological literature on the associations between vitamin D and cancer outcomes in general and among racial and ethnic minoritized groups?

Search terms: Words that were similar or synonymous to the following relevant topics: epidemiology, serum vitamin D, cancer, and racial/ethnic minoritized groups.

561 studies imported for screening (**377** PubMed, **184** Scopus) → **80** duplicates identified by Covidence

481 title-abstracts of studies screened for eligibility → **399** studies irrelevant

142 full-text studies assessed for eligibility → **99** studies excluded
67 didn't measure serum vitamin D levels or as the exposure
16 didn't measure a cancer outcome or as the outcome
13 were not accessible
2 didn't include racial/ethnic stratification
1 was not epidemiological or a review with epidemiology

43 studies extracted for analysis and synthesis of key themes

Figure 2. Scoping review stages 1-4 of current study.

Table 1. Whether or not investigators found and/or noted vitamin D deficiency among racial/ethnic minoritized groups by focus of study.

	Total studies (n)	Studies noting deficient Vitamin D levels among minoritized groups (n)
Focused exclusively on r/e minoritized group(s)	13	11
Focused on all available r/e groups	30	22
Total studies (n)	43	33

Table 2. Whether or not investigators found different associations between serum vitamin D status and their cancer outcome of interest by cancer type (step 4).

	Total studies (n)	Studies finding an overall significant adjusted association (n)	Studies exclusively focusing on minoritized r/e group(s) (n)	Studies finding a significantly different association across r/e groups (n)	Studies finding similar or no associations across r/e groups (n)	Studies that did not analyze associations across r/e groups (n)
Prostate Diagnosis Aggressive* Both	13 5 4 4	8 3 4 1	2 1 1 0	5 1 2 2	2 0 0 1	4 3 0 1
Colorectal	10	6	3	2	4	1
Breast	8	7	6	2	0	0
Multiple	5	2	1	1	3	0
Gastric	2	1	1	1	0	0
Pancreatic	2	1	0	0	1	1
Pediatric	1	1	0	1	0	0
Uterine	1	1	1	1	0	0
Parathyroid	1	1	0	0	1	0
Total studies (n)	43	28	14	13	11	6

*The cancer outcome of interest in the given study was aggressive prostate cancer.

Discussion

- 13/43 studies focused exclusively on a racial/ethnic group with 11/13 finding substantial prevalence of insufficient vitamin D and another 11/13 finding a significant inverse association between 25(OH)D and cancer outcome.

- 30/43 studies did not have exclusive focus with 18/30 studies reporting substantial 25(OH)D insufficiency by r/e group, especially for African Americans (AAs).

- 28/43 studies found an overall significant adjusted association between 25(OH)D and their cancer outcome of interest while 15/43 studies did not.

- 8/13 prostate cancer studies found this association with 5/8 finding it more significantly in AAs.

- 6/10 colorectal cancer studies found this association, but with mixed methodologies and outcomes of measure.

- 5/8 breast cancer studies were on Asian groups abroad with only one finding a non-significant association.

- 13/37 studies found a significantly different association across r/e groups.

Conclusions

- Vitamin D deficiency seemed to be most common in AA groups and Asian groups outside the U.S.

- More than half of all studies found significant inverse associations between 25(OH)D and their cancer outcome → important to keep studying.

- There is enough epidemiological research to substantiate vitamin D as a predictor of prostate cancer, but not for other cancers → more analysis is underway.

- Compared to similar literature reviews, this was first to focus on r/e groups where a third of the studies found a significantly different association between groups.

- Further analysis will determine more literature gaps and directly inform a relative quantitative study.

References

Arksey, H., & O'Malley, L. (2005). Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*, 8(1), 19–32. https://doi.org/10.1080/1364557032000119616.

Mondul, A. M., Weinstein, S. J., Layne, T. M., & Albanes, D. (2017). Vitamin D and Cancer Risk and Mortality: State of the Science, Gaps, and Challenges. *Epidemiologic reviews*, 39(1), 28–48. https://doi.org/10.1093/epirev/mxx005.