Whisky vs Wine: Systematic Review with ☸SAIMSARA.

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Review Stats

- Generated: 2025-12-25 15:17:11 CET
- Plan: Premium (expanded craft tokens; source: Europe PMC)
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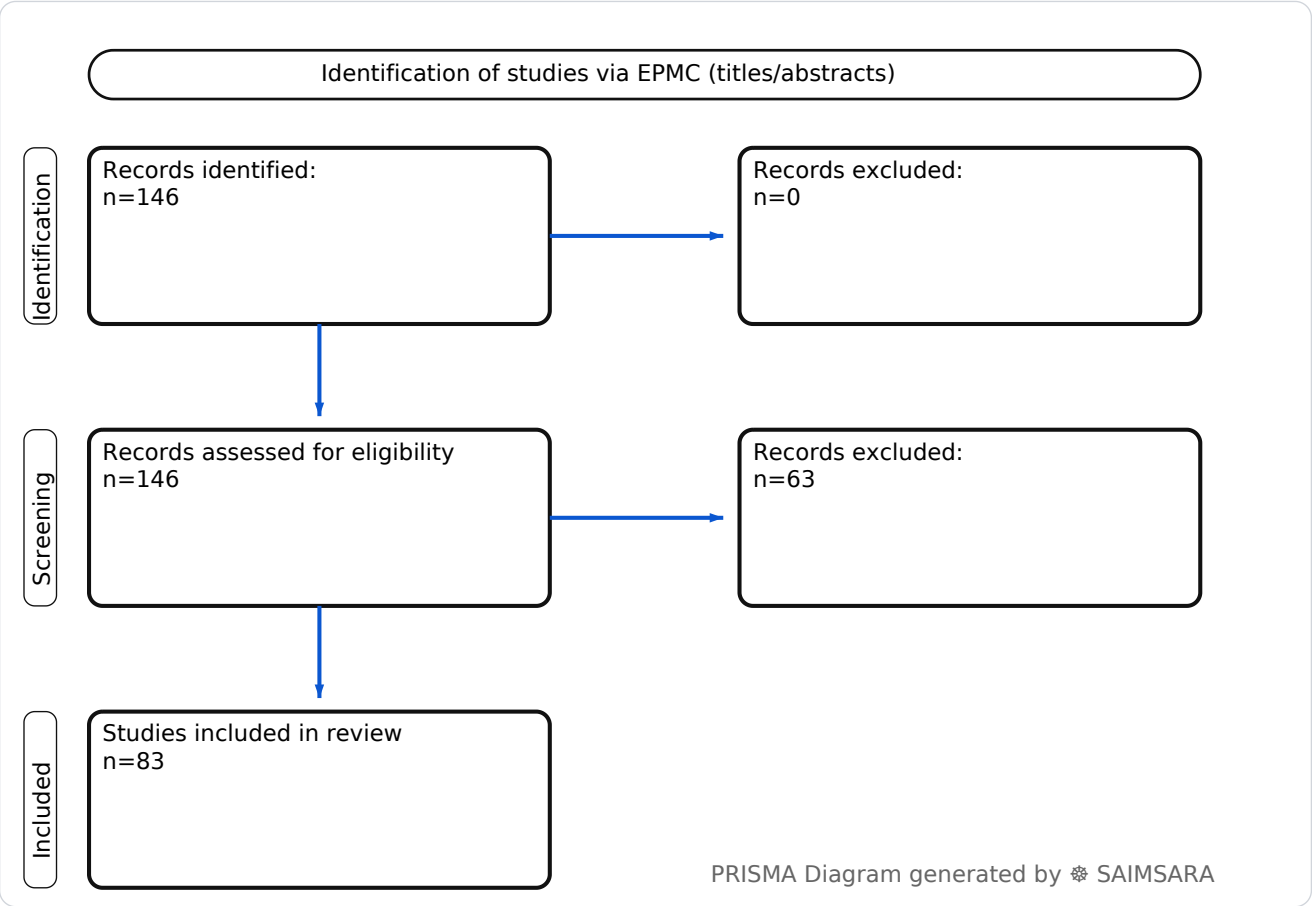
- Scope: Titles/Abstracts (tiab)
- Keyword Gate: Fuzzy (≥60% of required terms, minimum 2 terms matched in title/abstract)
- Total Abstracts/Papers: 146
- Downloaded Abstracts/Papers: 146
- Included original Abstracts/Papers: 83
- Total study participants (naïve ΣN): 52843



△OSMA Triangle generated by ☸SAIMSARA

Outcome-Sentiment Meta-Analysis (OSMA): *(LLM-only)*

Frame: Head-to-Head (A vs B) • *Source*: Europe PMC

Comparators: A = Whisky; B = Wine

Outcome: Outcome Typical timepoints: 15-day, 6-y. Reported metrics: %, CI, p.

Common endpoints: Common endpoints: alcoholic beverages, red wine, whisky lactone.

Predictor: Whisky vs Wine — exposure/predictor. Doses/units seen: 9.90 µg.

- **1) A favored (Whisky)** — Outcome with Whisky vs Wine — [18], [19], [36], [43] — ΣN=32
- **2) B favored (Wine)** — Outcome with Whisky vs Wine — [29], [32], [37], [42] — ΣN=2575
- **3) Neutral (no difference)** — Outcome with Whisky vs Wine — [1], [2], [3], [4], [5], [6], [7], [8], [9], [10], [11], [12], [13], [14], [15], [16], [17], [20], [21], [22], [23], [24], [25], [26], [27], [28], [30], [31], [33], [34], [35], [38], [39], [40], [41], [44], [45], [46], [47], [48], [49], [50], [51], [52], [53], [54], [55], [56], [57], [58], [59], [60], [61], [62], [63], [64], [65], [66], [67], [68], [69], [70], [71], [72], [73], [74], [75], [76], [77], [78], [79], [80], [81], [82], [83] — ΣN=50236

1) Introduction

Whisky and wine represent two distinct categories of alcoholic beverages, each with unique production methods, chemical compositions, and consumption patterns. Whisky, a distilled spirit typically aged in oak barrels, is known for its complex aromatic profile and higher ethanol content. Wine, a fermented beverage primarily from grapes, also benefits from oak aging in many varieties, developing characteristic sensory attributes. Beyond their sensory differences, these beverages are implicated in diverse physiological responses, health outcomes, and socio-economic dynamics. Understanding the comparative impacts of whisky and wine is crucial for public health, consumer science, and the beverage industry, necessitating a structured review of existing scientific literature.

2) Aim

The aim of this paper is to synthesize current research comparing whisky and wine across chemical, physiological, health, and socio-economic dimensions, identifying key distinctions and areas requiring further investigation.

3) Methods

Systematic review with multilayer AI research agent: keyword normalization, retrieval & structuring, and paper synthesis (see SAIMSARA About section for details).

- **Bias:** The qualitative assessment of bias is challenged by the prevalence of "Mixed" study designs, often lacking detailed methodological descriptions. This heterogeneity, alongside a mix of *in vitro*, animal, and human studies, introduces varying degrees of selection, performance, detection, and reporting biases. The absence of specified directionality in most studies further complicates the assessment of causality.

4) Results

4.1 Study characteristics:

The review encompassed a broad range of study designs, including numerous "Mixed" studies, alongside Randomized Controlled Trials (RCTs), Cohort studies, and Cross-sectional analyses. Populations and settings were highly diverse, ranging from healthy human volunteers and specific national cohorts (e.g., Korean adults, Japanese men) to *in vitro* models (e.g., *Escherichia coli*, rat pancreatic acinar cells), and analyses of beverage samples themselves. Follow-up periods varied significantly, with many studies not specifying a duration ("N/A"), while others ranged from acute observations (e.g., 30 minutes to 48 hours) to long-term assessments (e.g., 10 years for wine aging, 2.6 years for health outcomes).

4.2 Main numerical result aligned to the query:

Whisky and wine exhibit distinct economic responses to price changes, with wine demonstrating a higher price elasticity (-0.955) compared to whisky (-0.587) in Taiwan, indicating greater sensitivity of wine consumption to price fluctuations [23]. Physiologically, the impact on gastric emptying shows conflicting results: one study indicated whisky did not significantly prolong gastric emptying times compared to equivalent ethanol concentrations, whereas red wine did [36], while another suggested whisky caused a significant slowdown of gastric emptying with magnitude increasing in the order of beer, red wine, and whisky [19]. Furthermore, whisky caused greater superficial staining and color change (ΔE) in a nanofilled composite resin compared to red wine, which showed statistically lower ΔE values [29].

4.3 Topic synthesis:

- **Aroma and Oak Aging Profiles:** *cis*- and *trans*-whisky lactones are significant odorants in various wines, including goji wines, contributing coconut-like and hay-like notes [1, 14, 41]. These lactones, along with eugenol, are key indicators of oak aging in wines and distillates, with barrel aging generally yielding higher concentrations than oak alternatives [15, 16, 20, 21, 25, 46, 49, 50]. *cis*-whisky lactone specifically demonstrates high binding affinity to red wine polymers, influencing perceived aroma [2, 3].
- **Gastrointestinal and Metabolic Responses:** Whisky consumption promotes a rapid spike in blood alcohol levels, often higher than beer or wine [18], and can lead to higher gastric ethanol concentrations maintained longer in fed states [7]. While several studies indicate that wine (and beer) are potent stimulants of gastric acid and gastrin release, whisky generally does not stimulate these responses or may even decrease gastric acid output [53, 60, 66, 67, 69, 75, 80]. However, conflicting evidence exists regarding whisky's effect on gastric emptying, with one study suggesting it does not prolong emptying [36] and another indicating a significant slowdown [19].
- **Health Implications and Toxicological Aspects:** Whisky contributes to ethyl carbamate exposure, a probable human carcinogen, accounting for 5% of intake in average Korean consumers and measured at 9.90 μg/kg in Korean whisky [26, 30, 63, 68]. While both whisky and red wine can increase plasma total phenol content and antioxidant capacity [38], whisky, as a non-grape spirit, exhibits higher reactivity towards hydroxyl radicals than expected [10]. High ethanol content in whisky (40%) has been shown to induce DNA damage in *Escherichia coli* [24]. Acute consumption of red wine or beer improved endothelial function, an effect not observed with whisky [37].
- **Socio-economic and Consumption Dynamics:** Wine exhibits a higher price elasticity (-0.955) than whisky (-0.587) in Taiwan, suggesting greater consumer sensitivity to price changes for wine [23]. Excise taxes on Scotch whisky are often over-shifted to prices (rate of 1.14) [6] and can constitute a substantial portion of retail price, ranging from 13% in the US

to 63% in Australia [9]. Frequent consumption of spirits, including whisky, is associated with a significantly higher risk of obesity/overweight among university students [42].

- **Forensic and Analytical Chemistry Applications:** Advanced analytical methods have been developed for detecting various substances in both whisky and wine, including benzodiazepines [31], midazolam [17], scopolamine [13], and gamma-hydroxybutyric acid (GHB)/gamma-butyrolactone (GBL) [33], crucial for forensic and safety applications. A statistical model can also differentiate authentic Scotch Whisky from fake samples [8]. Notably, ethyl glucoside (EG) isomers, absent in whisky, can be detected in urine after whisky consumption, implying *in vivo* synthesis [5].
- **Material Interactions and Environmental Contaminants:** Whisky causes greater superficial staining and color change (ΔE) in nanofilled composite resin compared to red wine [29]. Whisky has also been successfully used as a complex solvent for open-to-air RAFT polymerization, highlighting its chemical robustness [12]. Aluminium levels vary significantly in both wine and whisky samples [45], and cadmium levels are detectable in wine and other alcoholic beverages [56].
- **Other Physiological Effects:** Both whisky and wine can lower iron absorption [71, 79]. Whisky consumption was among the alcoholic drinks most highly associated with increased levels of alcohol craving in outpatients diagnosed with Alcohol Use Disorder (AUD) [27]. In rats, red wine and whisky produced more undesirable effects on the liver than ethanol alone [65], though other studies found congeners lacked important hepatotoxic effects [81].

5) Discussion

5.1 Principal finding:

In economic terms, wine demonstrates a higher price elasticity (-0.955) compared to whisky (-0.587) in Taiwan, indicating that wine consumption is more sensitive to price fluctuations than whisky consumption [23].

5.2 Clinical implications:

- **Gastric Health Management:** Patients with acid-related gastrointestinal issues might benefit from choosing whisky over wine or beer, as whisky does not stimulate gastric acid or gastrin release [60, 66, 67, 69, 75, 80].
- **Cardiovascular Health Recommendations:** Given that red wine and beer may improve endothelial function while whisky does not [37], specific beverage recommendations could be considered for individuals at risk of cardiovascular disease.
- **Obesity Prevention Strategies:** Healthcare providers should be aware that frequent consumption of spirits, including whisky, is associated with a higher risk of

obesity/overweight [42], informing dietary and lifestyle counseling.

- **Drug-Alcohol Interaction Awareness:** The development of methods to detect benzodiazepines [31], midazolam [17], and scopolamine [13] in both whisky and wine is critical for clinicians and emergency services in cases of suspected drug-facilitated assaults or adverse drug-alcohol interactions.
- **Nutritional Considerations:** Both whisky and wine can diminish iron absorption [71, 79], a factor to consider for individuals with iron deficiency or those consuming iron supplements.

5.3 Research implications / key gaps:

- **Clarify Gastric Emptying Dynamics:** Standardized comparative studies are needed to definitively resolve conflicting findings on whisky's effect on gastric emptying relative to wine [19, 36].
- **Long-term Health Outcomes:** Longitudinal cohort studies are required to systematically compare long-term health outcomes, including cancer risk, bone strength, and neurological effects, between chronic whisky and wine consumption [55, 72, 83].
- **Aroma Compound Bioavailability:** Research should investigate the *in vivo* sensory impact and bioavailability of whisky lactones and their interactions with wine polymers, beyond *in vitro* binding affinities [2, 3].
- **Ethanol Metabolite Pathways:** Further exploration of the *in vivo* synthesis of ethyl glucoside after whisky consumption [5] and the formation of monoethyl carbonate in mixed drinks [34] is crucial for understanding metabolic health implications.
- **Congener-Specific Physiological Effects:** Detailed studies are warranted to compare the specific physiological effects of non-ethanol congeners in whisky versus wine on various organ systems, given their differential impacts observed in some studies [65].

5.4 Limitations:

- **Heterogeneous Study Designs** — The reliance on "Mixed" study designs without detailed descriptions limits the ability to assess internal validity and generalizability across studies.
- **Limited Direct Comparisons** — Few studies directly compared whisky and wine across the same outcome metrics, making comprehensive quantitative synthesis challenging.
- **Varied Population Demographics** — Studies involved diverse populations (e.g., healthy volunteers, specific national cohorts, *in vitro* models), which restricts the generalizability of findings to specific demographic groups.

- **Lack of Dose-Response Data** — Many studies lacked specific dose-response relationships for whisky and wine consumption, hindering the establishment of thresholds for effects.
- **Incomplete Follow-up Information** — A significant number of studies did not specify follow-up periods or reported "N/A," limiting the understanding of long-term effects.

5.5 Future directions:

- **Standardized Comparative Trials** — Conduct controlled clinical trials directly comparing whisky and wine across a range of physiological and health endpoints.
- **Mechanistic Aroma Studies** — Investigate the molecular mechanisms of whisky lactone interaction with wine components and their sensory impact.
- **Longitudinal Health Cohorts** — Establish large, longitudinal cohorts to track differential health impacts of whisky vs wine consumption over time.
- **Toxicological Profile Elucidation** — Systematically compare the full toxicological profiles, including ethyl carbamate and heavy metals, in various whisky and wine types.
- **Economic Impact Analysis** — Further analyze the economic and policy implications of differential price elasticities and taxation on consumption patterns.

6) Conclusion

Whisky and wine exhibit distinct economic responses to price changes, with wine demonstrating a higher price elasticity (-0.955) compared to whisky (-0.587) in Taiwan, indicating greater sensitivity of wine consumption to price fluctuations [23]. These findings, drawn from diverse research settings including human physiological studies, chemical analyses, and socio-economic evaluations, highlight varied impacts across health, sensory, and economic domains. However, the heterogeneity in study designs and the scarcity of direct comparative data across identical metrics significantly limit the certainty of comprehensive conclusions. Future research should prioritize standardized comparative studies to elucidate the full spectrum of differential effects of whisky versus wine on human health and behavior.

References

SAIMSARA Session Index — session.json

Figure 1. Publication-year distribution of included originals

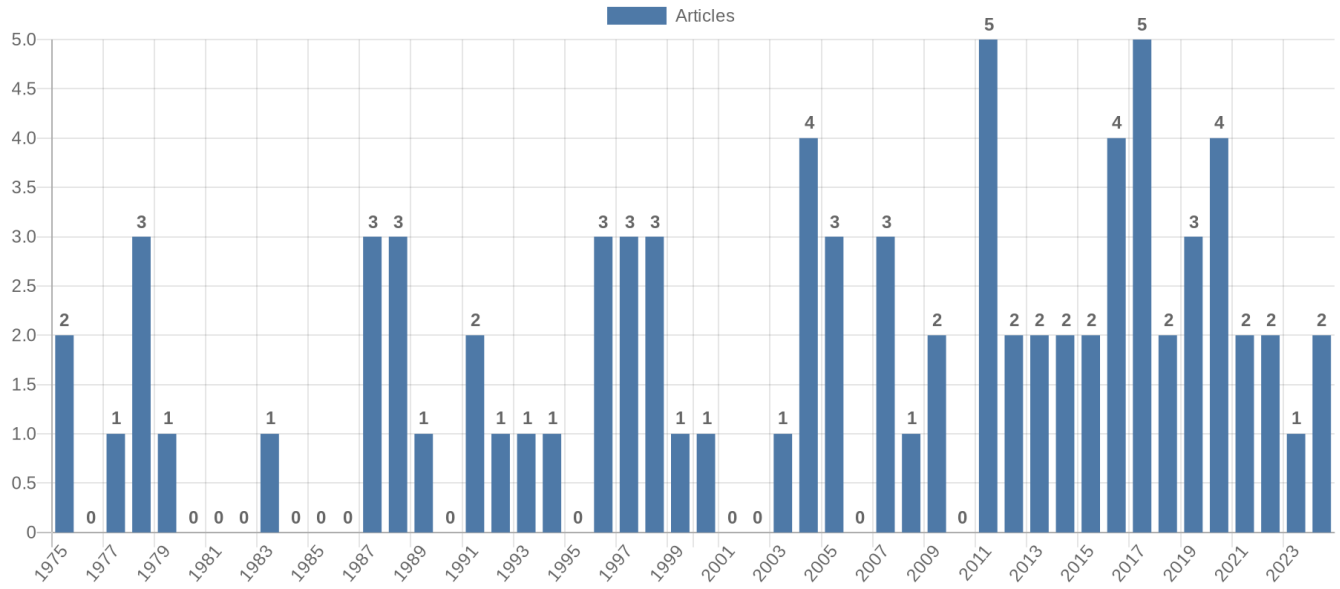


Figure 2. Study-design distribution of included originals

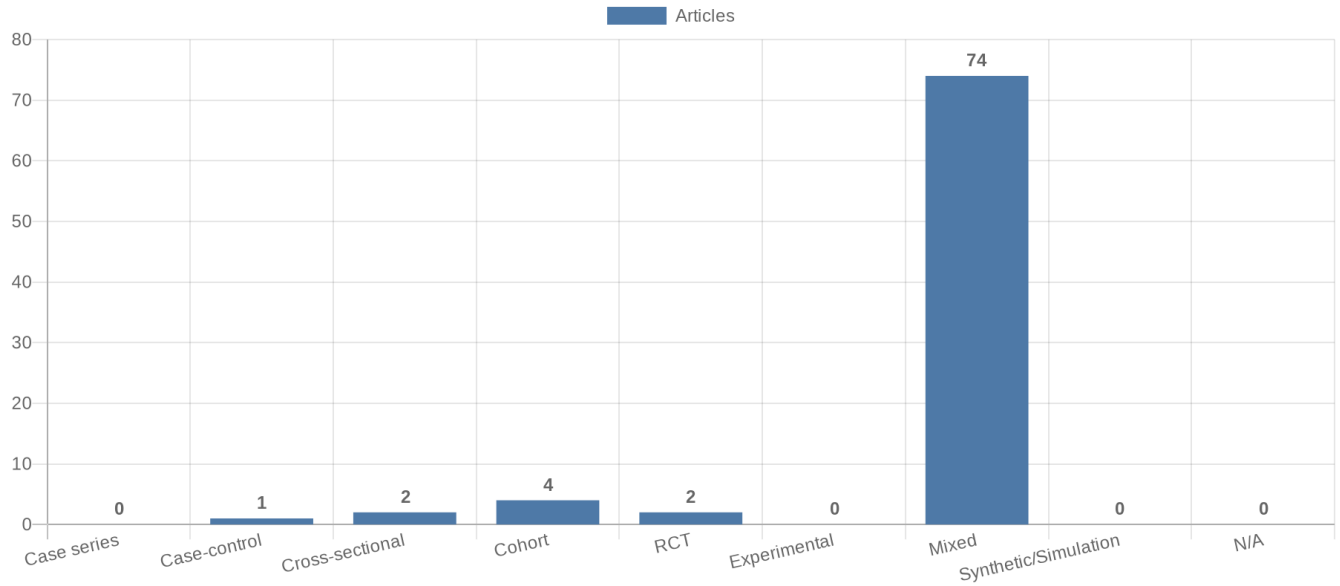


Figure 3. Study-type (directionality) distribution of included originals

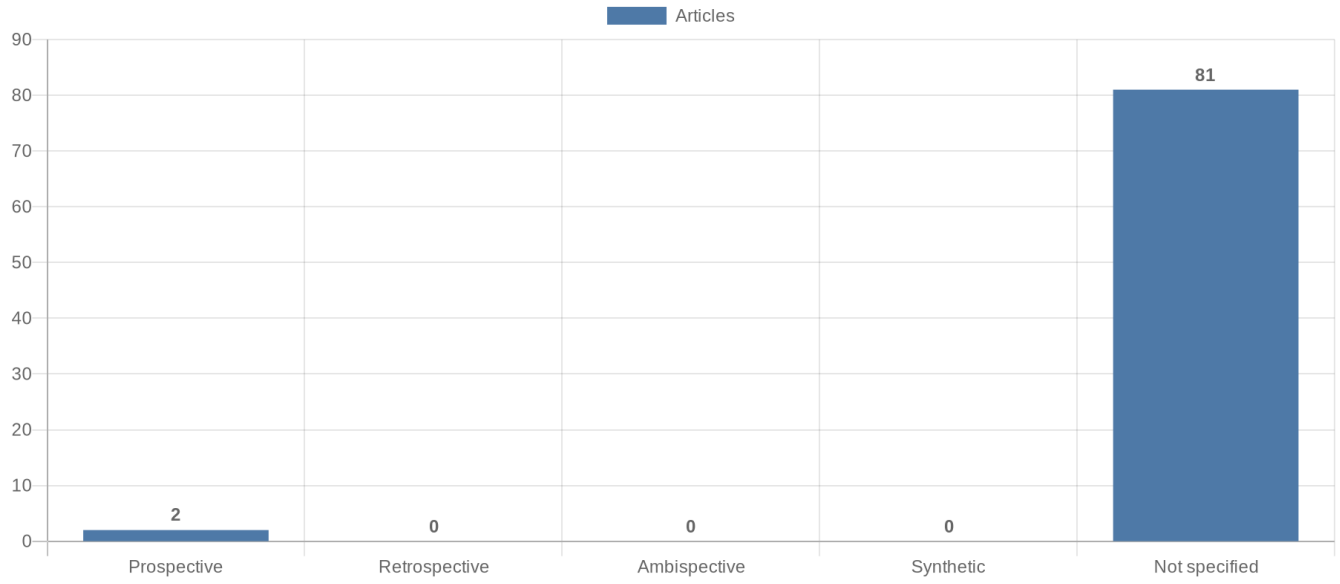


Figure 4. Main extracted research topics

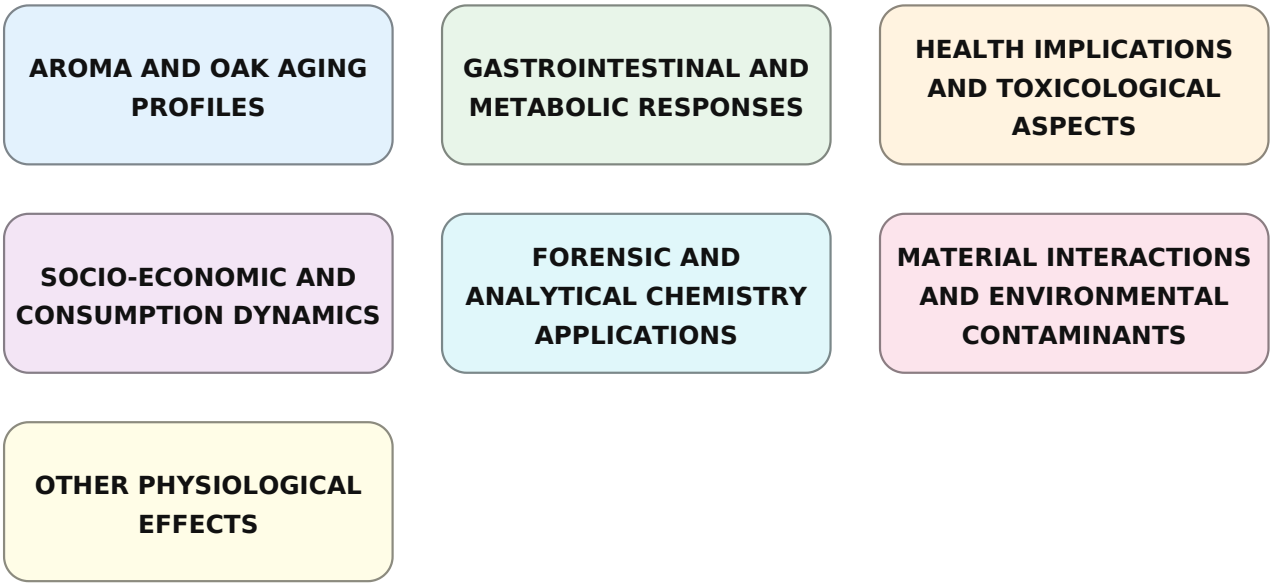


Figure 5. Limitations of current studies (topics)

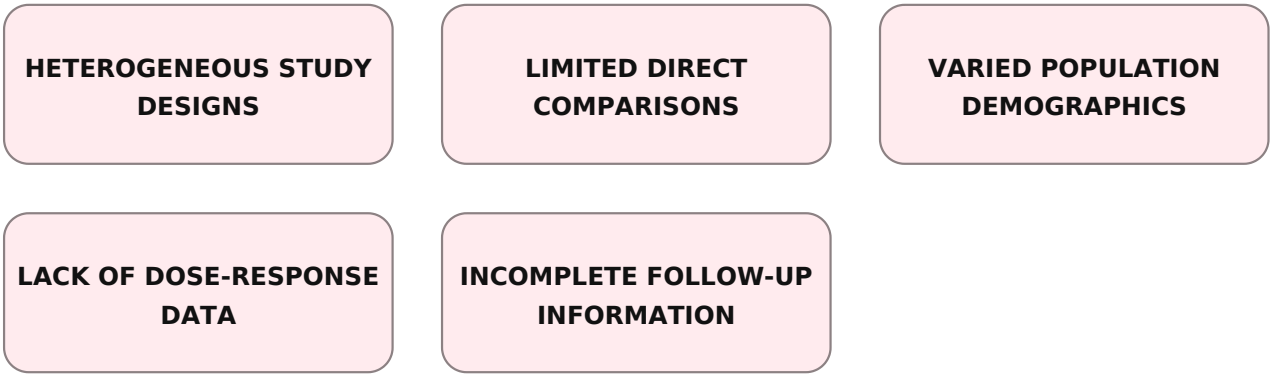


Figure 6. Future research directions (topics)