

# Online Appendix 7.

## Methods of umbrella review

### Methods

Medline and Scopus databases were searched to identify all relevant studies from inception until 30 June 2018. Search terms of each part were constructed based on research questions (PICO<sup>1</sup>). Two reviewers independently selected the identified studies. Systematic reviews of randomized-controlled trials or observational studies were eligible for the review, if they met all of the following inclusion criteria.

### Inclusion Criteria

#### For the Outcome of Hypertension

1. Studies that included adult population aged  $\geq 18$  years, who were or were not obese/overweight, and who also had or had not prehypertension
2. Studies that considered lifestyle interventions (i.e. any types of diet control, physical activity/exercise, smoking cessation, alcohol cessation, sleep modification) as preventive intervention or considered unhealthy lifestyle (i.e. harmful diet including high salt intake, physical inactivity, smoking, alcohol drinking, and poor sleep behavior) as interested risk factors
3. Studies that measured the outcome as incidence of hypertension

#### For the Outcome of Diabetes Mellitus

1. Studies that included adult population aged  $\geq 18$  years, who were or were not obese/overweight, and had or had not prediabetes
2. Studies that considered lifestyle interventions (i.e. any types of diet control, physical activity/exercise, smoking cessation, alcohol cessation, sleep modification) as preventive intervention or considered unhealthy lifestyle (i.e. harmful diet including

---

<sup>1</sup> PICO: P = interested participant, I = interested intervention, C = comparator, O = interested outcome

sugar sweetened beverages, physical inactivity, smoking, alcohol drinking, and poor sleep behavior) as interested risk factors

3. Studies that measured the outcome as incidence of diabetes mellitus

### For the Outcome of CVDs

1. Studies that included adult population aged  $\geq 18$  years, who were or were not obese/overweight, and had or had not prehypertension, prediabetes, hypertension, and diabetes mellitus
2. Studies that considered lifestyle interventions (i.e. any types of diet control, physical activity/exercise, smoking cessation, alcohol cessation, sleep modification) as preventive intervention or considered unhealthy lifestyle (i.e. harmful diet, physical inactivity, smoking, alcohol drinking, and poor sleep behavior) as interested risk factors
3. Studies that measured the outcome as incidence of CVDs including coronary artery disease, acute coronary syndrome, cerebrovascular disease, and CVD death

Results of study selection and reasons of exclusion of the studies for each reviewer was recorded in the Excel file and will be validated using STATA program. Percent agreement between two reviewers will be calculated using Kappa statistic.

## Data Extraction

Data was extracted using a standardized data record form. The studies' characteristics, numbers of included studies, types of population, interested intervention or factor, comparator, duration of follow-up, and types of outcome including definition and method of outcome measurement were extracted by 2 independent reviewers. If the included studies performed meta-analysis, pooled risk ratio (RR) or odds ratio (OR) with their 95% confidence intervals (CI) and degrees of heterogeneity was extracted.

## Data synthesis

Qualitative synthesis was applied to summarize the data.