SUPPLEMENTAL DATA

Fruit and vegetable consumption and health outcomes: an umbrella review of observational studies

Donato Angelino¹, Justyna Godos²,³, Francesca Ghelfi³,⁴, Maria Tieri⁴, Lucilla Titta⁴, Alessandra Lafranconi⁵,⁶, Stefano Marventano⁷, Elena Alonzo⁸, Angelo Gambera⁹, Salvatore Sciacca¹⁰, Silvio Buscemi¹¹, Sumantra Ray³,¹², Fabio Galvano², Daniele Del Rio¹,³,¹³, Giuseppe Grosso²,³

¹ The Laboratory of Phytochemicals in Physiology, Department of Food and Drug, University of Parma, Parma, Italy;
² Department of Biomedical and Biotechnological Sciences, University of Catania, Catania, Italy;
³ NNEdPro Global Centre for Nutrition and Health, St John's Innovation Centre, Cambridge, United Kingdom;
⁴ SmartFood Program, Department of Experimental Oncology, IEO, European Institute of Oncology IRCCS, Milan, Italy;
⁵ University of Milano – Bicocca, Milan, Italy;
⁶ Care and Public Health Research Institute, Maastricht University, Maastricht, The Netherlands;
⁷ Rimini Women’s Health, Childhood and Adolescent Department, AUSL Romagna, Rimini, Italy;
⁸ Food and Nutrition Security and Public Health Service, ASP Catania, Catania, Italy;
⁹ Azienda Ospedaliero-Universitaria Policlinico-Vittorio Emanuele, Catania, Italy;
¹⁰ Integrated Cancer Registry of Catania-Messina-Siracusa-Enna, Azienda Ospedaliero-Universitaria Policlinico-Vittorio Emanuele, Catania, Italy;
¹¹ Biomedical Department of Internal and Specialist Medicine (DIBIMIS), University of Palermo, Palermo, Italy;
¹² Medical Research Council (MRC) Human Nutrition Research Unit, Cambridge, United Kingdom;
¹³ The Laboratory of Phytochemicals in Physiology, Department of Veterinary Science, University of Parma, Parma, Italy.

Corresponding author: Giuseppe Grosso, Department of Biomedical and Biotechnological Sciences, University of Catania, Via Santa Sofia 97, 95123 Catania, Italy (email: giuseppe.grosso@studium.unict.it; Phone +39 095 4781156; Fax +39 095 4781156)
**Supplementary Table 1.** Summary results from meta-analyses investigating continuous linear exposure to fruit consumption and health outcomes. NA, not available.

| Outcome                  | Number of Studies | Exposure (increment) | RR (95% CI) | I²  | Reference                |
|--------------------------|-------------------|----------------------|-------------|-----|--------------------------|
| Colorectal Cancer        | 13                | 100 g/d              | 0.98 (0.94, 1.01) | 64% | Aune et al. 2011         |
| Breast Cancer            | 10                | 200 g/d              | 0.94 (0.89, 1.00) | 39% | Aune et al. 2012         |
| Non-Hodgkin’s lymphoma   | 5                 | 1 serving            | 1.01 (0.97, 1.05) | 45% | Chen et al. 2013         |
| Stroke                   | 8                 | 200 g/d              | 0.68 (0.56, 0.82) | NA  | Hu et al. 2014           |
| Gastric cancer           | 16                | 100 g/d              | 0.95 (0.91, 0.99) | 0%  | Wang Q et al. 2014       |
| All-cause mortality      | 7                 | 1 serving            | 0.94 (0.90, 0.98) | 77% | Wang X et al. 2014       |
| CVD mortality            | 6                 | 1 serving            | 0.95 (0.91, 1.00) | 71% | Wang X et al. 2014       |
| Cancer mortality         | 7                 | 1 serving            | 0.99 (0.97, 1.00) | 14% | Wang X et al. 2014       |
| CHD                      | 22                | 300 g/d              | 0.84 (0.75, 0.93) | 32% | Gan et al. 2015          |
| Bladder Cancer           | 8                 | 200 g/d              | 0.97 (0.87, 1.08) | 26% | Liu et al. 2015          |
| T2DM                     | 9                 | 1 serving            | 0.91 (0.89, 0.94) | NA  | Wu Y et al. 2015         |
| Lung cancer              | 23                | 100 g/d              | 0.92 (0.89, 0.95) | 1%  | Vieira et al. 2016       |
| Hypertension             | 5                 | 1 serving            | 0.98 (0.97, 0.99) | NA  | Wu L et al. 2016         |
**Supplementary Table 2.** Significance and direction of results from selected meta-analyses on fruit consumption and health outcomes. “S” denotes significant results; NS denotes non-significant results; symbols “+” and “-“ denote direction of the association. NA, not available.

| Outcome                  | Main results | Adjustment | Subgroups | Reference                  |
|--------------------------|--------------|------------|-----------|----------------------------|
|                          |              | BMI        | Alcohol   | Education     | Smoking | Men | Women | US    | Europe | Asia | Smoking no | Smoking yes |                   |
| Colon Cancer             | S-           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Aune et al. 2011 |
| Colorectal Cancer        | S-           | NS         | S-        | NA           | NS      | NS  | S     | S     | NS     | NA   | NA         | NA          | Aune et al. 2011 |
| Rectal cancer            | NS           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Aune et al. 2011 |
| Breast Cancer            | S-           | NS         | NS        | NS           | NS      | NA  | S     | NA    | NS     | NA   | NA         | NA          | Aune et al. 2012 |
| Pancreatic cancer        | NS           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Paluszkiewicz et al. 2012 |
| Non-Hodgkin’s lymphoma   | NS           | NS         | S+        | NA           | NS      | NS  | NS    | NS    | NA     | NA   | NA         | NA          | Chen et al. 2013  |
| Pancreatic cancer        | S-           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Alsamarrai et al. 2014 |
| Stroke                   | S-           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Hu et al. 2014   |
| Prostate Cancer          | NS           | NA         | NA        | NA           | NA      | NA  | NS    | NS    | NS     | NA   | NA         | NA          | Meng et al. 2014  |
| Asthma                   | S-           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Seyyedrezaazadeh et al. 2014 |
| Liver cancer             | NS           | NS         | NS        | NA           | NS      | NA  | NA    | S     | S     | NS   | NA         | NA          | Yang et al. 2014  |
| Gastric cancer           | S-           | NA         | NA        | NA           | NA      | NA  | NS    | S     | S     | NS   | NA         | NA          | Fang et al. 2015  |
| CHD                      | S-           | S-         | NA        | S-           | S-      | S-  | S     | S     | S     | NS   | NA         | NA          | Gan et al. 2015   |
| Bladder cancer           | NS           | NA         | NA        | NA           | NA      | NA  | NS    | NS    | NS     | NS   | NA         | NA          | Xu et al. 2015    |
| CVD                      | S-           | NA         | NA        | NA           | S-      | S-  | S     | S     | S     | S    | NA         | NA          | Zhan et al. 2017  |
| Depression               | S-           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Liu et al. 2016   |
| Hip fracture             | NS           | NA         | NA        | NA           | NS      | S-  | NA    | NS    | NS     | NS   | NA         | NA          | Luo et al. 2016   |
| Lung cancer              | S-           | NA         | NA        | NA           | S-      | S-  | S     | S     | S     | S    | NA         | NA          | Vieira et al. 2016 |
| T2DM                     | S-           | NA         | NA        | NA           | NA      | NA  | S     | S     | S     | S    | NA         | NA          | Wang et al. 2016  |
| Hypertension             | S-           | NA         | NA        | NA           | S-      | S-  | S     | S     | S     | S    | NA         | NA          | Wu L et al. 2016  |
| Pancreatic cancer        | NS           | NA         | NA        | NA           | NA      | NA  | NA    | NA    | NA     | NA   | NA         | NA          | Wu Q et al. 2016  |
**Supplementary Table 3.** Characteristics and main findings of meta-analyses of cohort studies on fruit consumption and same outcomes over time.

| Outcome            | Number Of Studies | RR          | I2  | Reference               |
|--------------------|-------------------|-------------|-----|-------------------------|
| Bladder cancer     | 11                | 0.91 (0.82, 1.00) | 11% | Vieira et al. 2015      |
| Bladder cancer     | 11                | 0.88 (0.79, 0.98) | 34% | Yao et al. 2014         |
| Bladder cancer     | 14                | 0.99 (0.99, 1.00) | 43% | Xu et al. 2015          |
| CHD                | 3                 | 0.86 (0.71, 1.05) | NA  | Law et al. 1998         |
| CHD                | 7                 | 0.89 (0.85, 0.93) | NA  | Dauchet et al. 2006     |
| CHD                | 9                 | 0.87 (0.80, 0.95) | 20% | He et al. 2007          |
| CHD                | 26                | 0.86 (0.82, 0.91) | 0%  | Gan et al. 2015         |
| Colon Cancer       | NA                | 1.01 (0.86, 1.18) | 25% | Huxley et al. 2009      |
| Colon Cancer       | 11                | 0.89 (0.81, 0.87) | 30% | Aune et al. 2011        |
| Colorectal Cancer  | 16                | 0.99 (0.90, 1.08) | 25% | Huxley et al. 2009      |
| Colorectal Cancer  | 14                | 0.90 (0.83, 0.98) | 41% | Aune et al. 2011        |
| Gastric cancer     | 13                | 0.89 (0.78, 1.02) | NA  | Lunet et al. 2005       |
| Gastric cancer     | 22                | 0.90 (0.83, 0.98) | 1%  | Wang Q et al. 2014      |
| Gastric cancer     | 30                | 0.93 (0.89, 0.98) | 2%  | Fang et al. 2015        |
| Hypertension       | 8                 | 0.73 (0.62, 0.86) | 68% | Li et al. 2016          |
| Hypertension       | 8                 | 0.87 (0.79, 0.95) | 64% | Wu L et al. 2016        |
| Lung cancer        | 19                | 0.84 (0.75, 0.94) | 49% | Wang M et al. 2015      |
| Lung cancer        | 20                | 0.84 (0.79, 0.90) | 21% | Wang Y et al. 2015      |
| Lung cancer        | 29                | 0.82 (0.76, 0.89) | 32% | Vieira et al. 2016      |
| Pancreatic cancer  | 5                 | 0.81 (0.61, 1.09) | 45% | Paluszkiewicz et al. 2012 |
| Pancreatic cancer  | 3                 | 0.65 (0.52, 0.82) | 0%  | Alsamarrai et al. 2014  |
| Pancreatic cancer  | 8                 | 0.93 (0.83, 1.03) | 35% | Wu Q et al. 2016        |
| Rectal cancer      | 5                 | 0.78 (0.63, 0.97) | 25% | Huxley et al. 2009      |
| Rectal cancer      | 7                 | 0.91 (0.76, 1.09) | 45% | Aune et al. 2011        |
| Stroke             | 4                 | 0.89 (0.85, 0.93) | NA  | Dauchet et al. 2005     |
| Stroke             | 19                | 0.77 (0.70, 0.84) | 52% | Hu et al. 2014          |
| T2DM               | 5                 | 1.01 (0.88, 1.15) | 4%  | Hamer et al. 2007       |
| T2DM               | 5                 | 0.92 (0.81, 1.02) | NA  | Cooper et al. 2012      |
| T2DM               | 9                 | 0.92 (0.86, 0.97) | 37% | Li S et al. 2015        |
| T2DM               | 12                | 0.91 (0.87, 0.96) | 11% | Wang et al. 2016        |
**Supplementary Table 4.** Results of meta-analyses on fruit consumption and health outcomes with limited number of prospective cohort studies (<3) or case-control studies (either alone or mixed with prospective cohort studies).

| Outcome                | Number Of Studies | Type Of Study Included | Specific Exposure     | RR       | I2      | Reference               |
|------------------------|-------------------|------------------------|-----------------------|----------|---------|-------------------------|
| Barrett’s Esophagus    | 4                 | 3CC + 1P               | Highest vs. lowest    | 0.65 (0.37, 1.13) | 77%     | Zhao et al. 2016         |
| Colorectal Adenoma     | 24                | 18CC + 6P              | Highest vs. lowest    | 0.79 (0.71, 0.88) | 27%     | Ben et al. 2015          |
| Crohn’s disease        | 10                | CC                     | Highest vs. lowest    | 0.57 (0.44, 0.74) | 59%     | Li F et al. 2015         |
| Endometrial Cancer     | 14                | 13CC + 1P              | Highest vs. lowest    | 0.90 (0.72, 1.12) | 75%     | Bandera et al. 2007      |
| Esophageal cancer      | 29                | 24CC + 5P              | Highest vs. lowest    | 0.53 (0.44, 0.64) | 73%     | Liu J et al. 2013        |
| Glioma                 | 17                | P+CC                   | Highest vs. lowest    | 0.83 (0.66, 1.04) | 83%     | Li Y et al. 2014         |
| Larynx cancer          | 8                 | P+CC                   | 100g/day increase     | 0.73 (0.64, 0.83) | NA      | Riboli et al. 2003       |
| Mouth and Pharynx      | 12                | P+CC                   | 100g/day increase     | 0.53 (0.37, 0.76) | NA      | Riboli et al. 2003       |
| Thyroid Cancer         | 9                 | CC                     | Highest vs. lowest    | 0.97 (0.78, 1.21) | 36%     | Liu Z et al. 2014        |
| Ulcerative colitis     | 8                 | CC                     | Highest vs. lowest    | 0.69 (0.49, 0.96) | 51%     | Li F et al. 2015         |
| Wheezing               | 15                | 13CS + 2P              | Highest vs. lowest    | 0.81 (0.74, 0.88) | NA      | Seyyedrezazadeh et al. 2014 |
**Supplementary Table 5.** Summary results from meta-analyses investigating continuous linear exposure to vegetable consumption and health outcomes. NA, not available.

| Outcome                   | Number Of Studies | Exposure (increment) | RR               | I2  | Reference               |
|---------------------------|-------------------|----------------------|------------------|-----|------------------------|
| Colorectal Cancer         | 12                | 100 g/d              | 0.98 (0.97, 0.99) | 0%  | Aune et al. 2011       |
| Breast Cancer             | 9                 | 200 g/day            | 1.00 (0.95, 1.06) | 17% | Aune et al. 2012       |
| Non-Hodgkin’s lymphoma    | 5                 | 1 serving            | 0.96 (0.92, 1.00) | NA  | Chen et al. 2013       |
| Stroke                    | 6                 | 200 g/d              | 0.89 (0.81, 0.98) | NA  | Hu et al. 2014         |
| Gastric cancer            | 16                | 100g/d               | 0.96 (0.91, 1.01) | 0%  | Wang Q et al. 2014     |
| All-cause mortality       | 7                 | 1 serving            | 0.95 (0.92, 0.99) | 86% | Wang X et al. 2014     |
| CVD mortality             | 6                 | 1 serving            | 0.96 (0.93, 0.99) | 63% | Wang X et al. 2014     |
| Cancer mortality          | 8                 | 1 serving            | 0.99 (0.97, 1.01) | 37% | Wang X et al. 2014     |
| CHD                       | 13                | 400 g/d              | 0.82 (0.73, 0.92) | 36% | Gan et al. 2015        |
| Bladder Cancer            | 6                 | 200 g/d              | 0.95 (0.88, 1.04) | 13% | Liu et al. 2015        |
| T2DM                      | 7                 | 1 serving            | 0.96 (0.95, 0.99) | NA  | Wu Y et al. 2015       |
| Lung cancer               | 20                | 100 g/day            | 0.94 (0.89, 0.98) | 0%  | Vieira et al. 2016     |
| Hypertension              | 7                 | 1 serving            | 1.00 (0.98, 1.01) | NA  | Wu L et al. 2016       |
**Supplementary Table 6.** Significance and direction of results from selected meta-analyses on vegetable consumption and health outcomes. “S” denotes significant results; NS denotes non-significant results; symbols “+” and “-” denote direction of the association. NA, not available.

| Outcome                  | Main results | Adjustment | Subgroups | Reference                  |
|--------------------------|--------------|------------|-----------|----------------------------|
|                          |              | BMI | Alcohol | Education | Smoking | Men | Women | US | Europe | Asia | Smoking no | Smoking yes |             |
| Colon Cancer             | S-           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Aune et al. 2011 |
| Colorectal Cancer        | S-           | S- | S- | NA | S- | NS | S | S- | NS | NS | NS | NA | Aune et al. 2011 |
| Rectal cancer            | NS           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Aune et al. 2011 |
| Breast Cancer            | NS           | NS | NS | NS | NS | NA | NA | NS | NS | NS | NS | NA | Aune et al. 2012 |
| Pancreatic cancer        | NS           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Paluszkieicz et al. 2012 |
| Non-Hodgkin’s lymphoma   | NS           | NS | NS | NA | NS | NS | S- | S- | S- | NA | NA | NA | Chen et al. 2013 |
| Pancreatic diseases      | S-           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Alsamarrai et al. 2014 |
| Stroke                   | S-           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Hu et al. 2014 |
| Prostate Cancer          | NS           | NA | NA | NA | NA | NA | NA | NS | NS | NS | NS | NA | Meng et al. 2014 |
| Liver cancer             | S-           | S- | S- | NA | S- | NA | NA | NS | NS | S- | NA | NA | Yang et al. 2014 |
| Gastric cancer           | NS           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Fang et al. 2015 |
| CHD                      | S-           | S- | NA | NA | S- | S- | S- | S- | NS | NA | NA | NA | Gan et al. 2015 |
| Bladder cancer           | NS           | NA | NA | NA | NA | NA | NA | NS | NS | S- | NA | NA | Xu et al. 2015 |
| CVD                      | S-           | NA | NA | NA | NA | S- | S- | S- | S- | S- | S- | NA | Zhan et al. 2017 |
| Depression               | S-           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Liu et al. 2016 |
| Hip fracture             | S-           | NA | NA | NA | NA | S- | NS | NA | NS | S- | NA | NA | Luo et al. 2016 |
| Lung cancer              | S-           | NA | NA | NA | S- | S- | S+ | NS | S- | NS | NS | S- (current) | Vieira et al. 2016 |
| T2DM                     | NS           | NA | NA | NA | NA | NS | NS | NS | NS | S- | NA | NA | Wang et al. 2016 |
| Hypertension             | S-           | NA | NA | NA | NA | S- | S- | S- | S- | S- | S- | NA | Na Wu L et al. 2016 |
| Age-related cataract     | S-           | NA | NA | NA | NA | NA | NA | S- | S- | S- | NA | NA | Huang et al. 2015 |
| Pancreatic cancer        | NS           | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | NA | Wu Q et al. 2016 |
### Supplementary Table 7. Characteristics and main findings of meta-analyses of cohort studies on vegetable consumption and some outcomes over time.

| Outcome          | Number Of Studies | RR         | I2  | Reference                  |
|------------------|-------------------|------------|-----|----------------------------|
| Bladder cancer   | 9                 | 0.92 (0.84, 1.01) | 5%  | Vieira et al. 2015         |
| Bladder cancer   | 9                 | 0.91 (0.82, 1.02) | 34% | Yao et al. 2014            |
| Bladder cancer   | 13                | 1.00 (0.99, 1.00) | 28% | Xu et al. 2015             |
| CHD              | 3                 | 0.82 (0.66, 1.02) | NA  | Law et al. 1998            |
| CHD              | 7                 | 0.97 (0.92, 1.04) | NA  | Dauchet et al. 2006        |
| CHD              | 9                 | 0.84 (0.76, 0.92) | 49% | He et al. 2007             |
| CHD              | 16                | 0.87 (0.81, 0.93) | 13% | Gan et al. 2015            |
| Colon Cancer     | NA                | 0.93 (0.82, 1.05) | 19% | Huxley et al. 2009         |
| Colon Cancer     | 11                | 0.87 (0.81, 0.94) | 0%  | Aune et al. 2011           |
| Colorectal Cancer| 16                | 0.95 (0.88, 1.04) | 19% | Huxley et al. 2009         |
| Colorectal Cancer| 16                | 0.91 (0.86, 0.96) | 0%  | Aune et al. 2011           |
| Gastric cancer   | 8                 | 0.98 (0.86, 1.13) | NA  | Lunet et al. 2005          |
| Gastric cancer   | 19                | 0.96 (0.88, 1.06) | 21% | Wang Q et al. 2014         |
| Gastric cancer   | 22                | 0.98 (0.91, 1.05) | 4%  | Fang et al. 2015           |
| Hypertension     | 6                 | 0.97 (0.91, 1.02) | 49% | Li et al. 2016             |
| Hypertension     | 8                 | 0.88 (0.79, 0.99) | 68% | Wu L et al. 2016           |
| Lung cancer      | 18                | 0.88 (0.81, 0.97) | 31% | Wang M et al. 2015         |
| Lung cancer      | 24                | 0.90 (0.84, 0.96) | 32% | Wang Y et al. 2015         |
| Lung cancer      | 25                | 0.92 (0.87, 0.97) | 0%  | Vieira et al. 2016         |
| Pancreatic cancer| 7                 | 0.87 (0.75, 1.01) | 0%  | Paluszkwicz et al. 2012    |
| Pancreatic cancer| 3                 | 0.77 (0.54, 1.10) | 56% | Alsamarrai et al. 2014     |
| Pancreatic cancer| 7                 | 0.89 (0.80, 1.00) | 0%  | Wu Q et al. 2016           |
| Rectal cancer    | 5                 | 0.88 (0.69, 1.12) | 19% | Huxley et al. 2009         |
| Rectal cancer    | 8                 | 0.94 (0.85, 1.04) | 0%  | Aune et al. 2011           |
| Stroke           | 4                 | 0.97 (0.92, 1.04) | NA  | Dauchet et al. 2005        |
| Stroke           | 16                | 0.86 (0.79, 0.93) | 40% | Hu et al. 2014             |
| T2DM             | 5                 | 0.97 (0.86, 1.10) | 5%  | Hamer et al. 2007          |
| T2DM             | 5                 | 0.89 (0.75, 1.03) | NA  | Cooper et al. 2012         |
| T2DM             | 11                | 0.91 (0.82, 1.01) | 57% | Wang et al. 2016           |
**Supplementary Table 8.** Results of meta-analyses on vegetable consumption and health outcomes with limited number of prospective cohort studies (<3) or case-control studies (either alone or mixed with prospective cohort studies).

| Outcome              | Number Of Studies | Type Of Study Included | Specific Exposure         | RR         | I2 | Reference                      |
|----------------------|-------------------|------------------------|---------------------------|------------|----|--------------------------------|
| Asthma               | 2                 | P                      | Highest vs. lowest        | 0.77 (0.35, 1.69) | NA | Seyedrezazadeh et al. 2014     |
| Barrett's Esophagus  | 4                 | 3CC + 1P               | Highest vs. lowest        | 0.45 (0.29, 0.70) | 61%| Zhao et al. 2016               |
| Colorectal Adenoma   | 21                | 15CC + 6P              | Highest vs. lowest        | 0.91 (0.80, 1.02) | 41%| Ben et al. 2015                |
| Crohn's disease      | 8                 | CC                     | Highest vs. lowest        | 0.66 (0.40, 1.09) | 67%| Li F et al. 2015               |
| Endometrial Cancer   | 10                | CC                     | Highest vs. lowest        | 0.71 (0.55, 0.91) | 61%| Bandera et al. 2007            |
| Esophageal cancer    | 24                | 19CC + 5P              | Highest vs. lowest        | 0.56 (0.45, 0.69) | 75%| Liu J et al. 2013              |
| Glioma               | 15                | P+CC                   | Highest vs. lowest        | 0.77 (0.69, 0.87) | 41%| Li Y et al. 2014               |
| Larynx cancer        | 8                 | P+CC                   | 100g/day increase         | 0.92 (0.83, 1.02) | NA | Riboli et al. 2003             |
| Mouth and Pharynx    | 12                | P+CC                   | 100g/day increase         | 0.84 (0.67, 1.07) | NA | Riboli et al. 2003             |
| Thyroid Cancer       | 5                 | CC                     | Highest vs. lowest        | 0.76 (0.58, 1.00) | 16%| Liu Z et al. 2014              |
| Ulcerative colitis   | 9                 | CC                     | Highest vs. lowest        | 0.71 (0.58, 0.88) | 42%| Li F et al. 2015               |
| Wheezing             | 11                | 10CS + 1P              | Highest vs. lowest        | 0.89 (0.81, 0.98) | NA | Seyedrezazadeh et al. 2014     |
**Supplementary Table 9.** Variables investigated to address the strength of evidence from selected meta-analyses on fruit and vegetable consumption and health outcomes.

| Outcome                  | Heterogeneity | Dose-response analysis | Agreement over time | Potential confounding | Reference                     |
|--------------------------|---------------|------------------------|---------------------|-----------------------|-------------------------------|
| **Fruit**                |               |                        |                     |                       |                               |
| Asthma                   | ⊕             | ⊕                      | ⊕                   | ⊕                     | Seyedrezazadeh et al. 2014   |
| Cancer (bladder)         | ⊗             | ⊕                      | ⊗                   |                       | Xu et al. 2015                |
| Cancer (breast)          | ⊗             | ⊕                      | ⊗                   | ⊗                     | Aune et al. 2012             |
| Cancer (colon)           | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2011             |
| Cancer (colorectum)      | ⊗             | ⊗                      | ⊗                   | ⊗                     | Aune et al. 2011             |
| Cancer (liver)           | ⊗             | ⊗                      | ⊗                   | ⊗                     | Yang et al. 2014             |
| Cancer (lung)            | ⊗             | ⊗                      | ⊗                   | ⊗                     | Vieira et al. 2014           |
| Cancer (NHL)             | ⊗             | ⊗                      | ⊗                   | ⊗                     | Chen et al. 2013             |
| Cancer (pancreas)        | ⊗             | ⊗                      | ⊗                   |                       | Wu Q et al. 2016             |
| Cancer (prostate)        | ⊗             | ⊗                      | ⊗                   |                       | Meng et al. 2014             |
| Cancer (rectum)          | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2011             |
| Cancer (stomach)         | ⊗             | ⊗                      | ⊗                   |                       | Fang et al. 2015             |
| CHD                      | ⊗             | ⊗                      | ⊗                   | ⊗                     | Gan et al. 2015              |
| CVD                      | ⊗             | ⊗                      | ⊗                   |                       | Zhan et al. 2017             |
| Depression               | ⊗             | ⊗                      | ⊗                   |                       | Liu et al. 2016              |
| Hip fracture             | ⊗             | ⊗                      | ⊗                   |                       | Luo et al. 2016              |
| Hypertension             | ⊗             | ⊗                      | ⊗                   |                       | Wu L et al. 2016             |
| Mortality (all-cause)*   | ⊗             | ⊗                      | ⊗                   | ⊗                     | Wang X et al. 2014           |
| Mortality (cancer)*      | ⊗             | ⊗                      | ⊗                   |                       | Wang X et al. 2014           |
| Mortality (CVD)*         | ⊗             | ⊗                      | ⊗                   |                       | Wang X et al. 2014           |
| Pancreatic diseases      | ⊗             | ⊗                      | ⊗                   |                       | Alsamarrai et al. 2014       |
| Stroke (total)           | ⊗             | ⊗                      | ⊗                   |                       | Hu et al. 2014               |
| T2DM                     | ⊗             | ⊗                      | ⊗                   |                       | Wang et al. 2016             |
| **Vegetable**            |               |                        |                     |                       |                               |
| Age-related cataract     | ⊗             | ⊗                      | ⊗                   | ⊗                     | Huang et al. 2015            |
| Cancer (bladder)         | ⊗             | ⊗                      | ⊗                   |                       | Xu et al. 2015                |
| Cancer (breast)          | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2012             |
| Cancer (colon)           | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2011             |
| Cancer (colorectum)      | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2011             |
| Cancer (liver)           | ⊗             | ⊗                      | ⊗                   |                       | Yang et al. 2014             |
| Cancer (lung)            | ⊗             | ⊗                      | ⊗                   |                       | Vieira et al. 2014           |
| Cancer (NHL)             | ⊗             | ⊗                      | ⊗                   |                       | Chen et al. 2013             |
| Cancer (pancreas)        | ⊗             | ⊗                      | ⊗                   |                       | Wu Q et al. 2016             |
| Cancer (prostate)        | ⊗             | ⊗                      | ⊗                   |                       | Meng et al. 2014             |
| Cancer (rectum)          | ⊗             | ⊗                      | ⊗                   |                       | Aune et al. 2011             |
| Cancer (stomach)         | ⊗             | ⊗                      | ⊗                   |                       | Fang et al. 2015             |
| CHD                      | ⊗             | ⊗                      | ⊗                   | ⊗                     | Gan et al. 2015              |
| CVD                      | ⊗             | ⊗                      | ⊗                   |                       | Zhan et al. 2017             |
| Depression               | ⊗             | ⊗                      | ⊗                   |                       | Liu et al. 2016              |
| Hip fracture             | ⊗             | ⊗                      | ⊗                   |                       | Luo et al. 2016              |
| Hypertension             | ⊗             | ⊗                      | ⊗                   |                       | Wu L et al. 2016             |
| Mortality (all-cause)*   | ⊗             | ⊗                      | ⊗                   | ⊗                     | Wang X et al. 2014           |
| Mortality (cancer)*      | ⊗             | ⊗                      | ⊗                   |                       | Wang X et al. 2014           |
| Mortality (CVD)*         | ⊗             | ⊗                      | ⊗                   |                       | Wang X et al. 2014           |
| Pancreatic diseases      | ⊗             | ⊗                      | ⊗                   |                       | Alsamarrai et al. 2014       |
| Stroke (total)           | ⊗             | ⊗                      | ⊗                   |                       | Hu et al. 2014               |
| T2DM                     | ⊗             | ⊗                      | ⊗                   |                       | Wang et al. 2016             |

*from meta-analysis on continuous exposure (dose-response).