# Fruit and Vegetable Concentrate Supplementation and Cardiovascular Health: A Systematic Review from a Public Health Perspective

Lorenzoni G, Minto C, Vecchio MG, Zec S, Paolin I, Lamprecht M, Mestroni L, Gregori D. Fruit and Vegetable Concentrate Supplementation and Cardiovascular Health: A Systematic Review from a Public Health Perspective. J Clin Med. 2019 Nov 8;8(11):1914. doi: 10.3390/jcm8111914. PMID: 31717327; PMCID: PMC6912365.

Juice Plus+
Science Institute
Advancing plant-based nutrition

# STUDY OBJECTIVES

- To perform a systematic review aimed at assessing the effect of fruit and vegetable (FV) concentrate supplementation on selected physiological parameters that are considered relevant risk factors for the development of cardiovascular diseases (CVDs).

- **Main study outcome:**

  Ten-year projection of coronary heart disease (CHD) prevalence and direct cost for the United States following FV concentrate supplementation or no supplementation.

**Physiological parameters ('surrogates') of interest**

| | | |
|---|---|---|
| Total cholesterol (TC) | Low-density lipoprotein (LDL) | Homocysteine (HCY) |
| Systolic blood pressure (SBP) | Body mass index | TNF-α |

Juice Plus+ Science Institute
Advancing plant-based nutrition

# METHODOLOGY

The systematic review included studies published in English, until 22 June 2018 meeting all of the following criteria.

| | |
|---|---|
| **Participants** | General population aged ≥18 years of both sexes |
| **Interventions** | Supplementation with fruits, vegetables or fruit and vegetable concentrates |
| **Comparisons** | Placebo or no treatment |
| **Outcomes** | Total cholesterol, low-density lipoprotein, plasmatic homocysteine, systolic blood pressure, body mass index |
| **Study design** | Interventional |

*This project was conducted under the direction of the Unit of Biostatistics, Epidemiology and Public Health, Department of Cardiac, Thoracic, Vascular Sciences and Public Health, University of Padova, Italy; in collaboration with the School of Medicine, University of Colorado, Aurora, CO, USA.*

Juice Plus+ Science Institute
Advancing plant-based nutrition

# RESULTS

- **13 articles** meeting the inclusion criteria were identified and included in the review
  - Encapsulated fruit and vegetable (FV, Juice Plus+®, n=7)
  - Artichoke leaf juice (n=1)
  - Jerusalem artichoke juice (n=1)
  - Orange juice (n= 1)
  - Fruit and vegetable drink (n= 1)
  - Cherry juice (n= 1)
  - Fruit juice (n= 1)


Juice Plus+ Science Institute
Advancing plant-based nutrition

# MAIN RESULTS – CHD EVENTS

- For the prevention of CHD events in the general population, FV supplementation was found to have the strongest impact compared to other types of nutritional interventions.
- This was followed by orange juice, cherry juice, fruit and vegetable drink, and fruit juice.
- The median estimated CHD events reduction projected to 2025, achieved by FV supplementation (through the mediation of HCY) is 62.41 millions events.

| | FV | Orange juice | Fruit and vegetable drink | Cherry juice | Fruit juice |
|---|---|---|---|---|---|
| HCY | (55.7, **62.41**, 81.12) | | (-1.35, 1.47, 9.4) | | |
| TC | (29.97, **36.26**, 53.72) | (7.04, 21.08, 42.86) | (4.86, 11.54, 28.72) | (13.76, 21.01, 37.24) | (-7.46, 8.62, 46.75) |
| LDL | (0.17, **0.61**, 1.9) | (-0.77, 4.9, 20.7) | (-0.35, 2.32, 10.2) | | (-1.71, 2.66, 15.16) |
| SBP | (6.47, **8.87**, 16.17) | | (-5.89, 2.33, 24.57) | (2.87, 11.88, 35.46) | |
| TNF-α | (1.17, **1.85**, 3.67) | | | | |

Table 1: Estimated effect in terms of the absolute numbers of coronary heart disease (CHD) events reduction for different supplementation regimes in the general population, projected in 2025. Reported events are expressed in millions of events (95% C.I. lower bound; median; 95% C.I. upper bound).

Juice Plus+ Science Institute
Advancing plant-based nutrition

# MAIN RESULTS – COST REDUCTION

- For the CHD treatment related cost savings in the general population, FV supplementation was found to have the strongest impact compared to other types of nutritional interventions.
- This was followed by orange juice, cherry juice, fruit and vegetable drink, and fruit juice.
- The median estimated direct cost reduction for the treatment of CHD, achieved by FV supplementation (through the mediation of HCY) is $109.76 bn.

| | FV | Orange juice | Fruit and vegetable drink | Cherry juice | Fruit juice |
|---|---|---|---|---|---|
| HCY | (96.17, **109.76**, 153.44) | | (-2.4, 2.55, 17.02) | | |
| TC | (52.16, **63.65**, 100.01) | (12.37, 37.11, 78.92) | (8.43, 20.31, 52.57) | (24.34, 36.8, 69.27) | (-13.07, 15, 84.05) |
| LDL | (0.29, **1.07**, 3.44) | (-1.36, 8.69, 37.37) | (-0.63, 4.06, 18.37) | | (-3.05, 4.65, 27.24) |
| SBP | (11.34, **15.54**, 29.6) | | (-10.29, 4.15, 44.62) | (5.05, 20.71, 64.77) | |
| TNF-α | (2.05, **3.23**, 6.7) | | | | |

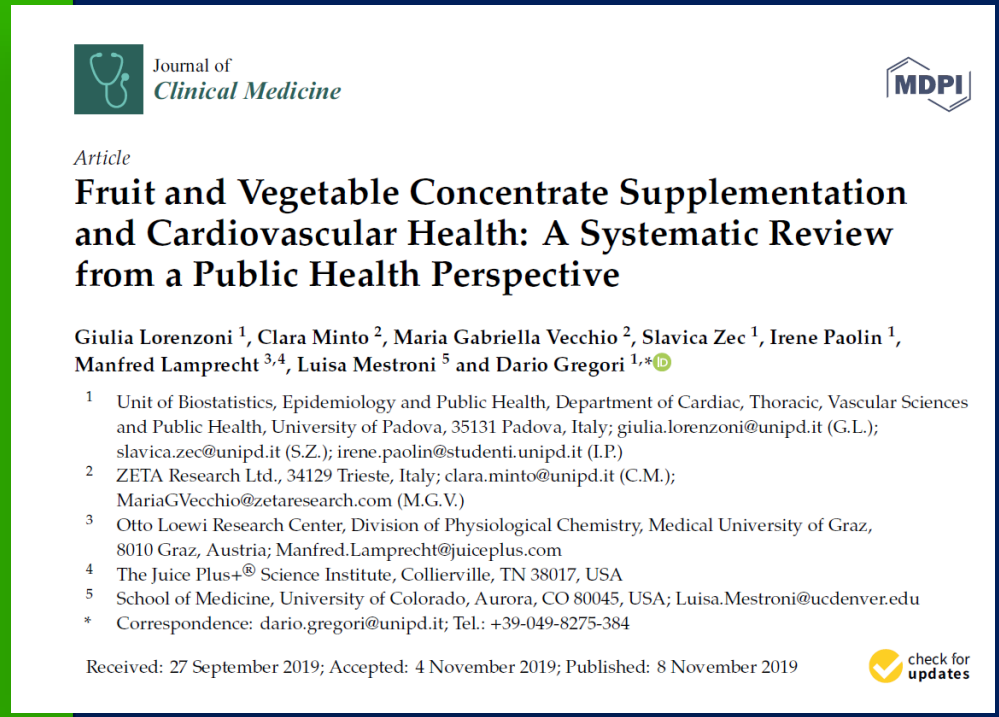
Table 2: Estimated effect in direct cost reduction for different supplementation regimes, for the treatment of coronary heart disease (CHD), in the general population, projected in 2025. Direct costs are expressed in billions of dollars (95% C.I. lower bound; median; 95% C.I. upper bound).

Juice Plus+ Science Institute
Advancing plant-based nutrition

# SUMMARY/CONCLUSION:

Based on this systematic review, published in a peer-reviewed and powerful scientific journal, supplementation with an encapsulated fruit and vegetable juice powder concentrate can save:

- **Millions* of coronary heart disease events** in the general US population over 10 years
- **Billions** of US-Dollars for the treatment of coronary heart diseases** in the general US population over 10 years



Journal of *Clinical Medicine*

MDPI

*Article*

**Fruit and Vegetable Concentrate Supplementation and Cardiovascular Health: A Systematic Review from a Public Health Perspective**

**Giulia Lorenzoni [1], Clara Minto [2], Maria Gabriella Vecchio [2], Slavica Zec [1], Irene Paolin [1], Manfred Lamprecht [3,4], Luisa Mestroni [5] and Dario Gregori [1,*]**

1 Unit of Biostatistics, Epidemiology and Public Health, Department of Cardiac, Thoracic, Vascular Sciences and Public Health, University of Padova, 35131 Padova, Italy; giulia.lorenzoni@unipd.it (G.L.); slavica.zec@unipd.it (S.Z.); irene.paolin@studenti.unipd.it (I.P.)
2 ZETA Research Ltd., 34129 Trieste, Italy; clara.minto@unipd.it (C.M.); MariaGVecchio@zetaresearch.com (M.G.V.)
3 Otto Loewi Research Center, Division of Physiological Chemistry, Medical University of Graz, 8010 Graz, Austria; Manfred.Lamprecht@juiceplus.com
4 The Juice Plus+® Science Institute, Collierville, TN 38017, USA
5 School of Medicine, University of Colorado, Aurora, CO 80045, USA; Luisa.Mestroni@ucdenver.edu
* Correspondence: dario.gregori@unipd.it; Tel.: +39-049-8275-384

Received: 27 September 2019; Accepted: 4 November 2019; Published: 8 November 2019

check for updates

*Exact numbers see Table 1
** Exact numbers see Table 2

Article available at: https://pubmed.ncbi.nlm.nih.gov/31717327/