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The energy needs of adults aged 65 years and over using doubly labelled water: current evidence and opportunities for international data sharing.

Introduction: The World Health Organisation predicts that by 2050, the world's population over 60 years will almost double to 2 billion and those over 80 years will almost triple from 125 million to 434 million. The challenges of the globally ageing population include impacts on the health, social, and economic systems. This shift in demographics has implications for nutrition science and practice. Assessment of energy and nutrient requirements are fundamental concepts however a synthesis of the evidence for total energy expenditure (TEE) has not been undertaken. For effective strategies to help manage nutrition-related chronic diseases and conditions, an accurate assessment of energy requirements is critical. The nuclear stable isotope technique of doubly labelled water (DLW) is the gold standard method for measuring TEE in free-living individuals. This study aimed to determine the extent of the international evidence for TEE measured using DLW in older adults (aged ≥ 65 years).

Methods: Participant level TEE data measured by DLW were identified using systematic review principles; the protocol was registered (PROSPERO registration CRD42016047549). Records of studies were included where all participants were aged ≥65 years, or where participant-level data could be obtained for those ≥65 years. There were no search restrictions on date, language or study designs of original research; reviews and conference abstracts were ineligible. Four databases (EMBASE, CINAHL Plus, MEDLINE complete and Cochrane Central) were searched up to July 2016. Title and abstract screening, then full text assessment of the identified records were undertaken by two independent evaluators. Where data at the participant level were not publicly accessible, attempts to contact the corresponding author by email to request access were made.

Results: The database search identified 1419 records, with another five identified via other sources. Full text of 317 records were reviewed, of which 170 were excluded mainly as a result of not meeting criteria for population (e.g. aged less than 65 years) and study design (e.g. energy expenditure not measured by DLW). Authors of the remaining 147 records were contacted to obtain participant level data not publically available. In total, data was obtained for 890 participants aged ≥ 65 years, and for only 248 participants aged ≥ 80 years. Data was unobtainable from approximately 67% of records for reasons including authors being unable to be contacted and or declining to participate and data no longer being retrievable.

Discussion: We have systematically reviewed the peer- reviewed literature to identify records reporting TEE measured in individuals aged 65 years and over. The majority of original data were irretrievable. The development of an international data repository is necessary to support future international research efforts, data sharing and reduce data loss over time.

A marked deficit of TEE measured by DLW in the older elderly (80 + years) was also evident. Use of stable isotopes are crucial in the development of contemporary energy expenditure data to inform policies and guidelines aimed to optimise the health and wellbeing of this rapidly growing age group.

Country

Australia

Institution

Monash University

Authors: Prof. PORTER, Judi (Monash University and Eastern Health); Dr NGUO, Kay (Monash University)

Co-authors: Dr HUGGINS, Catherine E (Monash University); Prof. TRUBY, Helen (Monash University); Dr

COLLINS, Jorja (Monash University); Dr KELLOW, Nicole (Monash University); Dr GIBSON, Simone (Monash University)

Presenter: Dr NGUO, Kay (Monash University)

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