

What we have learned from the doubly-labelled water method about human energy balance?

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The classical method for measuring energy expenditure is based on respiratory gas exchange. From the consumption of oxygen and production of CO₂ an estimate can be made of energy expenditure. The key problem with this approach is that to measure gas exchange it is necessary to confine people – either to lying down with a hood on their head, or within a small room, or wearing mask type devices. These approaches then are largely unable to tell us the actual cost of living on a day to day basis. The doubly-labelled water method is a different approach which relies on the differential elimination of stable isotopes of hydrogen and oxygen to estimate CO₂ production. It has an accuracy error of about 2% and a precision error of about 7%. The method was developed in the 1950s but was not used on humans until 1982. Since then, it has been used on about 20,000 people providing several insights into questions that can be answered in no other way. In this talk, after describing how the method works, I will focus on several things we have discovered using it. This will include the contribution that declines in physical activity have made to the obesity epidemic, how good people are at reporting their food intake in surveys, and how energy expenditure varies across the human life course.