表4 地域別(都会・田舎)の230人の日本人参加者における総脂肪・トランス型脂肪酸の摂取量

| | 女性 ($n$ = 120) | | | | | 男性 ($n$ = 110) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 都会 ($n$ = 58) | | 田舎 ($n$ = 62) | | $P^{\dagger}$ | 都会 ($n$ = 54) | | 田舎 ($n$ = 56) | | $P^{\dagger}$ |
| | 平均 | 標準偏差 | 平均 | 標準偏差 | | 平均 | 標準偏差 | 平均 | 標準偏差 | |
| 総脂肪摂取量 (g/日) | 58.2 | 12.3 | 56.2 | 10.8 | 0.35 | 69.9 | 14.6 | 67.4 | 17.3 | 0.40 |
| 総脂肪摂取量 (総エネルギー摂取量の%) | 28.9 | 3.2 | 26.8 | 3.5 | < 0.001 | 27.0 | 3.7 | 24.6 | 3.4 | < 0.001 |
| トランス型脂肪酸摂取量 (g/日) | 2.0 | 0.6 | 1.6 | 0.6 | 0.02 | 2.0 | 0.9 | 1.7 | 0.7 | 0.04 |
| トランス型脂肪酸摂取量 (総エネルギー摂取量の%) | 1.0 | 0.5 | 0.7 | 0.3 | 0.004 | 0.9 | 0.3 | 0.6 | 0.2 | 0.002 |
| トランス型脂肪酸摂取量 (総脂肪摂取量の%) | 3.3 | 1.3 | 2.7 | 0.8 | 0.01 | 2.8 | 0.8 | 2.4 | 0.6 | 0.02 |

*人口密度に従い(44)、4地域を都会(高い2地域:大阪・沖縄)もしくは田舎(低い地域:長野・鳥取)に分けた。

†2地域の参加者の摂取量の差はnon-paired t-testによって解析した。

表5　年齢階級別の230人の日本人参加者における総脂肪・トランス型脂肪酸の摂取量

| | 女性 ($n$ = 120) | | | | | | | | | 男性($n$ = 110) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 30~39 歳 ($n$ = 28) | | 40~49 歳 ($n$ = 29) | | 50~59 歳 ($n$ = 32) | | 60~69 歳 ($n$ = 31) | | $P^{*}$ | 30~39 歳 ($n$ = 21) | | 40~49 歳 ($n$ = 32) | | 50~59 歳 ($n$ = 28) | | 60~69 歳 ($n$ = 29) | | $P^{*}$ |
| | 平均 | 標準偏差 | 平均 | 標準偏差 | 平均 | 標準偏差 | 平均 | 標準偏差 | | 平均 | 標準 | 平均 | 標準偏差 | 平均 | 標準偏差 | 平均 | 標準偏差 | |
| 総脂肪摂取量 (g/日) | 61.5$^{a}$ | 13.6 | 58.8$^{ab}$ | 12.4 | 55.0$^{ab}$ | 9.6 | 54.0$^{bc}$ | 9.3 | 0.005 | 71.0$^{a}$ | 14 | 73.8$^{ab}$ | 21.4 | 69.4$^{ab}$ | 12.7 | 60.8$^{bc}$ | 9.5 | 0.007 |
| 総脂肪摂取量 (総エネルギー摂取量の%) | 29.4$^{a}$ | 3.2 | 29.0$^{ab}$ | 2.9 | 26.7$^{bc}$ | 3.1 | 26.4$^{c}$ | 3.6 | <0.001 | 27.7$^{a}$ | 2.2 | 26.3$^{ab}$ | 4.5 | 25.6$^{b}$ | 3.7 | 23.9$^{bc}$ | 2.7 | <0.001 |
| トランス型脂肪酸摂取量 (g/日) | 2.3$^{a}$ | 1.4 | 1.9$^{ab}$ | 0.8 | 1.7$^{bc}$ | 0.6 | 1.2$^{c}$ | 0.4 | <0.001 | 2.1$^{a}$ | 0.8 | 2.1 | 1.0 | 1.7 | 0.6 | 1.4$^{b}$ | 0.6 | <0.001 |
| トランス型脂肪酸摂取量 (総エネルギー摂取量の%) | 1.1$^{a}$ | 0.6 | 0.9$^{ab}$ | 0.3 | 0.8$^{bc}$ | 0.2 | 0.6$^{c}$ | 0.2 | <0.001 | 0.8$^{a}$ | 0.2 | 0.8 | 0.3 | 0.6$^{b}$ | 0.2 | 0.6$^{bc}$ | 0.2 | <0.001 |
| トランス型脂肪酸摂取量 (総脂肪摂取量の%) | 3.6$^{a}$ | 1.5 | 3.2$^{abd}$ | 0.8 | 3.0$^{bc}$ | 0.8 | 2.2$^{cd}$ | 0.6 | <0.001 | 2.9$^{a}$ | 0.6 | 2.8$^{ab}$ | 0.8 | 2.4$^{bc}$ | 0.6 | 2.4$^{c}$ | 0.8 | 0.002 |

$^{a,b,c,d}$上付き文字が異なる列の数値は有意に異なる、$P$ <0.05 (Tukey multiple comparison test)。

$^{*}$年齢階級ごとの差はanalysis of varianceによって解析した。

表6 230人の日本人参加者のトランス型脂肪酸摂取量(1日の総エネルギー摂取量に対する割合)の分布

| | $n$ | % |
|---|---|---|
| 女性 ($n$ = 120) | | |
| 0.33~0.49% | 14 | 11.7 |
| 0.50~0.74% | 43 | 35.8 |
| 0.75~0.99% | 33 | 27.5 |
| 1.00~1.24% | 15 | 12.5 |
| 1.25~1.49% | 10 | 8.3 |
| 1.50~1.74% | 3 | 2.5 |
| 1.75~1.99% | 1 | 0.8 |
| 3.50~3.62% | 1 | 0.8 |
| 男性 ($n$ = 110) | | |
| 0.30~0.49% | 27 | 24.5 |
| 0.50~0.74% | 47 | 42.7 |
| 0.75~0.99% | 26 | 23.6 |
| 1.00~1.24% | 8 | 7.3 |
| 1.25~1.36% | 2 | 1.8 |

# 日本人の食事摂取基準（2010年版）における参考文献情報の特徴に関する検討

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研究要旨
食事摂取基準2010年版で最終的に採用された論文の特徴を明らかにし、将来における食事摂取基準の策定に資する資料を提供することを目的として、参考文献の特徴の整理を試みた。結果は次のとおりであった。総参考文献数は1244であった（章を超えた重複あり）。種類別には学術論文が全体の88%を占め、その内訳は日本人を対象とした論文が23%、その他が65%であった。次に多かったのはガイドライン・教科書・専門書の類であり、10%であった。残りの2%は報告書・書籍・学会発表・インターネット情報であった。また、英文と和文の比は85%：15%であった。さらに、最近20年間の栄養所要量ならびに食事摂取基準における参考文献数の推移を検討した結果、食事摂取基準2010年版における参考文献数がもっとも多く、第4次改定栄養所要量（1990年）に比べると5倍以上もの参考文献が用いられたことが明らかとなった。
今回の策定ではいままでの栄養所要量、食事摂取基準に比べて数多くの参考文献が用いられたことが明らかとなり、その多くが、学術論文であり、残りのほぼすべてをガイドライン・教科書・専門書が占めていた。日本人を対象として行われた研究は学術論文のうち3割に満たなかったが、全体としては、量・質ともにじゅうぶんな科学情報を用いた策定に成功したものと考えられた。

## A.　はじめに

栄養所要量ならびに食事摂取基準は近年ほぼ5年ごとに改定されてきたが、そこで用いられた参考文献を系統的に吟味する試みはなかったように思われる。どのような参考文献が用いられているかは、栄養所要量ならびに食事摂取基準の質と信頼度を示す非常に客観的かつ重要な指標であると考えられる。そこで、食事摂取基準2010年版で用いられた参考文献の数と書誌情報を用いて、食事摂取基準2010年版で最終的に採用された論文の特徴を明らかにすることを試みた。

## B.　研究方法

### 1．方法（食事摂取基準2010年版）

食事摂取基準（2010年版）で直接に引用されている参考文献の書誌情報（著者名、論題、発行年）を参考に、章ごとに、次の内容に沿って分類した：論文の種類（学術論文、ガイドライン・教科書・専門書、報告書、学会発表、インターネット情報）、言語（英語、日本語）、出版年（1979年以前、1980-84年、1985-89年、1990-94年、1995-99年、2000-04年、2005年以後）。ただし、異なる章で同じ文献が引用されていることがあり、可能な限り、重複は除外したが、除外しきれなかったものがある恐れは若干残っているものと思われる。

### 2．方法（栄養所要量・食事摂取基準にお

ける参考文献数の推移）

栄養所要量（1990年[第四次改定]、1995年[第五次改定]、2000年[第六次改定]）ならびに食事摂取基準（食事摂取基準2005年版、食事摂取基準2010年版）で直接に引用されている参考文献数を数え、その推移を観察した。ただし、異なる章で同じ文献が引用されていることがあり、可能な限り、重複は除外したが、除外しきれなかったものがある恐れは若干残っているものと思われる。

## C. 結果

### 1．食事摂取基準2010年版で用いられた参考文献の特徴のまとめ

結果を表1に示す。総参考文献数は1244であった（章を超えた重複あり）。

章別には微量ミネラルが258文献ともっとも多く、妊婦・授乳婦が17文献ともっと少なかった。しかしながら、1ページ当たりの文献数でみると、妊婦・授乳婦が12.0文献、高齢者11.6文献、炭水化物10.6文献、脂質9.8文献、多量ミネラル9.3文献と、高位は比較的にそろっていた。一方、総論が1.4文献と他の章に比べて際立って少ないことが明らかとなった。

種類別には学術論文が全体の88%を占め、その内訳は日本人を対象とした論文が23%、その他が65%であった。次に多かったのはガイドライン・教科書・専門書の類であり、10%であった。残りの2%は報告書・書籍・学会発表・インターネット情報であった。また、英文と和文の比は85%：15%であった。

出版（掲載）年を5年ごとに区切って比較すると、最近の5年間ほど引用数が多く、2005以後が349文献（28%）、続いて2000-04年が292文献（23%）であり、この2つで全体の51%を占めていた。一方、1979年以前、1980-84年の文献もそれぞれ7%ずつ用いられていた。

### 2. 栄養所要量・食事摂取基準における参考文献数の推移

結果を図1に示す。第四次改定と第五次改定の栄養所要量における参考文献数は225と276であったが、第六次改定の栄養所要量で大きく増加し、632であった。そして、食事摂取基準2005年版においてさらに850に増加し、食事摂取基準2010年版では1244に達し、これは第四次改定の栄養所要量における参考文献数の5倍以上であった。

## D. まとめと考察

今回の策定ではいままでの栄養所要量、食事摂取基準に比べて非常に数多くの参考文献が用いられたことが明らかとなり、その多くが、学術論文であり、残りのほぼすべてをガイドライン・教科書・専門書が占めていた。日本人を対象として行われた研究は学術論文のうち3割に満たなかったが、全体としては、量・質ともにじゅうぶんな科学情報を用いた策定に成功したものと考えられた。

## E. 研究発表

### 1．論文発表

なし

### 2．学会発表

なし

## F. 参考文献

なし

## G. 知的所有権の取得状況

### 1. 特許取得

なし

### 2. 実用新案登録

なし

### 3. その他

なし

表1　日本人の食事摂取基準（2010年版）で用いられた参考文献数の特徴

| 集計方法 | 分類 | 参考文献数 |
|---|---|---|
| 章別* | | |
| | 総論 | 55, 38, (1.4) |
| | エネルギー | 92, 13, (7.1) |
| | たんぱく質 | 73, 9, (8.1) |
| | 脂質 | 166, 17, (9.8) |
| | 炭水化物 | 53, 5, (10.6) |
| | 脂溶性ビタミン | 112, 19, (5.9) |
| | 水溶性ビタミン | 138, 24, (5.8) |
| | 多量ミネラル | 140, 15, (9.3) |
| | 微量ミネラル | 258, 35, (7.4) |
| | 乳児・小児 | 36, 3, (12) |
| | 妊婦・授乳婦 | 17, 3, (5.7) |
| | 高齢者 | 104, 9, (11.6) |
| | 合計 | 1244, 190, (6.5) |
| 文献種類別** | | |
| | 学術誌論文 | 1098 [88%] |
| | 日本人を対象とした研究*** | 291 [23%] |
| | その他 | 807 [65%] |
| | ガイドライン、教科書、専門書 | 130 [10%] |
| | 報告書 | 6 [0%] |
| | 書籍 | 7 [1%] |
| | 学会発表 | 1 [0%] |
| | インターネット | 2 [0%] |
| 言語別** | | |
| | 英語（英文） | 1063 [85%] |
| | 日本語（和文） | 181 [15%] |
| 出版（掲載）年別** | | |
| | 1979年以前 | 91 [7%] |
| | 1980～1984年 | 91 [7%] |
| | 1985～1989年 | 111 [9%] |
| | 1990～1994年 | 132 [11%] |
| | 1995～1999年 | 178 [14%] |
| | 2000～2004年 | 292 [23%] |
| | 2005年以後 | 349 [28%] |

* 数値は左から、文献数、ページ数、1ページあたり文献数。
ページは、日本人の食事摂取基準（2010年版）「日本人の食事摂取基準」策定検討会報告書. 厚生労働省健康局総務課生活習慣病対策室（平成21年5月） に基づく。
** 数値は左から、文献数、全体に占める割合。
*** 筆頭から3人までの著者がすべて日本人名、または、
タイトルから明らかに日本で行われた研究であると判断されたもの。

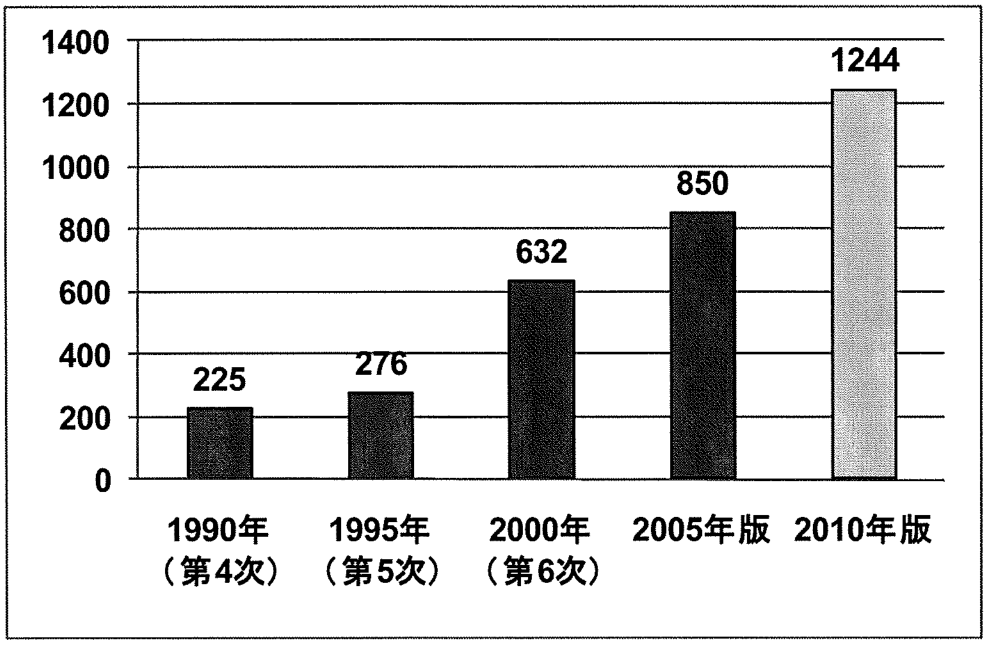


図１　栄養所要量（第四次改定[1990 年]、第五次改定[1995 年]、第六次改定[2000 年]）、食事摂取基準（2005 年版、2010 年版）における参考文献数の推移
注意：章ごとの参考文献数の合計値であるため、重複して数えられた。

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分担研究報告書

# 日本人の食事摂取基準（2010 年版）「総論・エネルギー」の英語訳

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研究要旨

「食事摂取基準 2010 年版」の「総論・エネルギー」部分の英語訳を行った。「総論」は日本人の食事摂取基準（2010 年版）の基本的な概念や策定根拠、活用の基礎的な考え方を記述したもっとも重要な部分であり、諸外国が自国の食事摂取基準の策定を試みる際に有用であると考えられる。ここで作成した英語訳が諸外国、特に、食習慣ならびに健康状況がわが国に類似する東アジア諸国の食事摂取基準の策定において有益な資料となるものと期待される。

## A.　はじめに

栄養所要量ならびに食事摂取基準は近年ほぼ 5 年ごとに改定されてきたが、そこで用いられた参考文献を系統的に吟味する試みはなかったように思われる。どのような参考文献が用いられているかは、栄養所要量ならびに食事摂取基準の質と信頼度を示す非常に客観的かつ重要な指標であると考えられる。そこで、食事摂取基準 2010 年版で用いられた参考文献の数と書誌情報を用いて、食事摂取基準 2010 年版で最終的に採用された論文の特徴を明らかにすることを試みた。

## B.　研究方法

### 方法

食事摂取基準（2010 年版）の「総論」部分について参考文献も含めて英語訳を行った。

## C. 結果

資料１のとおりである。

## D.　まとめと考察

いままでわが国の栄養所要量・食事摂取基準が諸外国で類似のガイドラインを策定するうえで参考にされることはほとんどなかったように思われる。一方、近隣東アジア諸国は類似の食習慣を有し、かつ、類似の健康問題を抱えている。食事摂取基準（2010 年版）には欧米諸国で策定された類似のガイドラインに含まれない独特の概念もあるため、食事摂取基準（2010 年版）を英語訳し、わが国における食事摂取基準策定の状況を知らしめることは、諸外国におけるこの種のガイドライン策定において有益な資料となることが期待される。

## E.　研究発表

### １．論文発表

なし

### ２．学会発表

なし

## F. 参考文献

なし

## G.　知的所有権の取得状況

### 1.　特許取得

なし

### 2.　実用新案登録

なし

**3. その他**

なし

資料 1

# DIETARY REFERENCE INTAKES FOR JAPANESE (2010)

**(REPORT FROM THE SCIENTIFIC COMMITTEE OF "DIETARY REFERENCE INTAKES FOR JAPANESE")**

**2010**

**MINISTRY OF HEALTH, LABOUR AND WELFARE, JAPAN**

**NOTE**

**This English translation is a section* of the report.**

**(*General Theories and Energy)**

**Translated by Satoshi Sasaki, M.D., Ph.D., Department of social and preventive epidemiology, School of Public Health, University of Tokyo, Japan**

**(stssasak@m.u-tokyo.ac.jp)**

**CONTENTS**

# I. General Theories

## 1. Introduction

The Dietary Reference Intakes for Japanese 2010 (DRIs-J) were developed for healthy individuals or groups and designed to give reference intakes of energy and nutrients to maintain or promote health and prevent lifestyle-related diseases.

The current DRIs-J have followed concepts of prior versions which have been thoroughly implemented in this version. It is desirable that those who use these DRIs-J should not be overly preoccupied with the values presented, but thoroughly understand the underlying concepts and apply them correctly. The DRIs-J were prepared on a scientific basis as much as possible. Domestic and overseas academic papers and obtainable academic materials were thoroughly used. Reports and materials used in the prior edition were also re-evaluated.

Illnesses related to nutritional intake in terms of volume, energy or nutrient content are not limited to deficiencies or poor intake, but can also be due to excessive intake. Appropriate nutritional intake is also related to the prevention of lifestyle-related diseases. Nutritional reference indices reflecting these goals need to be established; this is the first basic concept of development of the DRIs-J.

However, in reality, "true" optimal intakes vary between individuals and depend on the state of the individual; they therefore cannot be measured or estimated. This suggests the need for a probabilistic approach in their establishment and application. This is the second basic concept of the DRIs-J.

Based on these two concepts, one index for energy and five indices for nutrients are presented. These indices are collectively called the "Dietary Reference Intakes (DRIs-J)."

The DRIs-J do not constitute a factsheet, but are to be used in various nutritional related operations. In this revision, basic theory was divided into two parts - development and application. The two parts of the theory are closely related and both require deep understanding. Also, basic versions were produced for life-stages needing special attention in development and application, such as infancy, pregnancy and lactation, and old age.

## 2. Basic Theory of Development

### 1. Development

The Dietary Reference Intakes for Japanese 2010 (DRIs-J) were developed on a scientific basis to the fullest extent possible. Domestic and overseas academic papers and other obtainable scientific materials were thoroughly used by a systematic review method. However, unlike other medical fields, methods to evaluate and define evidence levels of data are not yet established in the fields of human nutrition, public health, and preventive nutrition. Therefore, most reliable information was obtained by carefully reviewing each study, where intelligence synthesis done quantitatively such as meta-analysis was referred first.

### 2. Selection criteria for nutrients and energy

Nutrients were selected based on the following criteria: 1) Essential for human life and the maintenance and improvement of health; 2) intakes for maintenance and improvement are quantitatively defined; 3) values are scientifically reliable, having achieved global consensus. Nutrients scientifically proven to be closely linked to lifestyle-related diseases of significant concern to the Japanese population were also selected. As a result, 34 nutrients were selected for this edition.

Quantitative values were established for those calculable according to gender and age group. Nutrients for which values could not be established due to insufficient evidence or dependence on application conditions were cited with references in the text.

Energy intakes were also developed as essential requirements for life.

### 3. Indices

3-1. Energy

For adults, a certain fixed energy intake is necessary to maintain weight; inadequate intake leads to weight loss, leanness, and protein-energy malnutrition. Excessive intake causes weight gain and obesity. Energy intake is optimized when it balances expenditure; then no weight change occurs. This value is called the Energy Requirement. However there is insufficient data on Japanese subjects, energy requirements have been established mainly using values measured for Japanese subjects and reference to values adopted in foreign countries. However, it is impossible to measure an individual's required intake accurately; hence most values available were estimations. The estimated values are called the Estimated Energy Requirements (EERs).

The EERs were established based on gender, age group and physical activity level (PALs) basis due to their effect on requirements. EER is used in place of true energy requirements where not measurable. Intake near the EER gives the highest probability of maintaining the individual's current weight; intake above EER will increase probability of weight gain, and intake below EER will increase probability of weight loss.

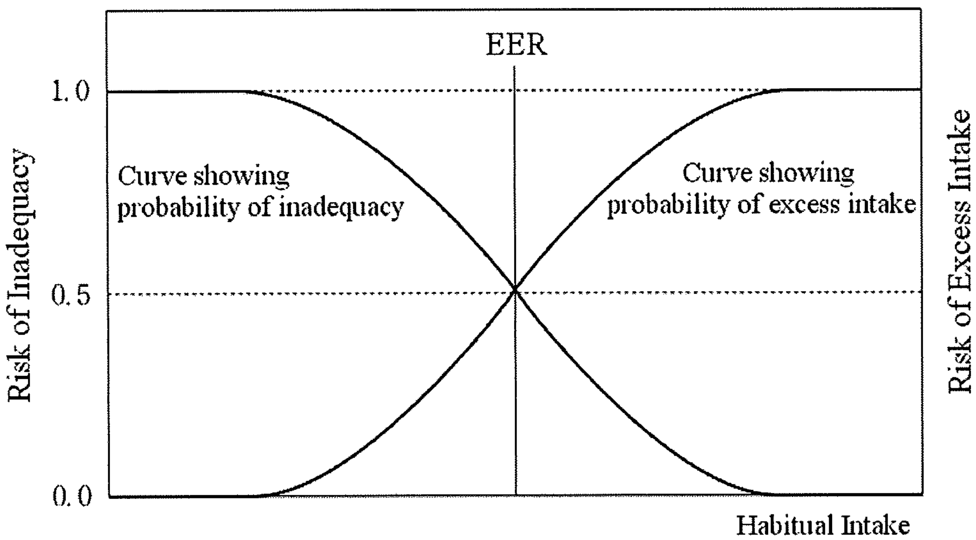


**Figure 1 Estimated Energy Requirement model**
Vertical axes show probability of inadequate intake for individuals and percentage of individuals with inadequate intake.

This concept is shown diagrammatically in Figure 1. By applying the concept to a group, the probability can also be converted to the percentage of the population with excessive or inadequate intake.

EERs differ based on PALs. In this edition, PALs were categorized into 3 levels with EERs established for each level. Refer to the chapter on energy for details.

3-2. Nutrients

3-2-1. Basic concept

34 nutrients were selected for the DRIs-J. In this section, common concepts of nutrients are provided. Refer to each nutrient chapter for details.
The Estimated Average Requirements (EAR) have been established as indices for evaluating nutrient levels and deficiencies. But as mentioned in the basic concepts chapter, the EAR is not sufficient to apply DRIs-J. Recommended Dietary Allowances (RDAs) have therefore been established to support the EAR. There are some nutrients for which EARs and RDAs could not be established. For those nutrients, the Adequate Intake (AI) is adopted. As we discuss later, the AI is more similar to the RDA than the EAR in application to DRIs-J. These three are the indices related to inadequacy.

Tolerable Upper Intake Levels (UL) are established to avoid health problems due to excessive intake. There are nutrients not currently adopted due to lack of sufficient scientific evidence.

Some nutrients require nutritional indices to support primary prevention of lifestyle-related diseases, but studies on them to date are insufficient in terms of number and quality.[1)] For those nutrients, the Tentative Dietary Goals for Preventing Lifestyle-related Diseases (DG) are adopted as intake levels for most Japanese people to aim for to support primary prevention of lifestyle-related diseases.

Figure 2 illustrates these indices. The figure shows habitual intake and risk of health problems due to excessive or inadequate intake, i.e. the relationship between nutritional intake and probability of health problems occurring. Applying this figure to a group gives the percentage of health problems occurring due to excessive or inadequate intake.

Characteristics and concepts related to these indices are listed in Table 1.[2)] There are few important points when applying these indices and details are written in the Basic Concept of Application chapter. From an application point of view, indices related to excessive or inadequate intake have highest priority; if those indices are not problematic, then primary prevention of lifestyle-related diseases has subsequent priority. It is desirable to consider the frequency and severity of health problems related to nutrients and prioritize them accordingly.

Table 2 is the list of established nutrients and indices established for those over one year-old. For new born infants (0 to 11 months) , indices for 30 nutrients are established, excluding saturated fatty acid, cholesterol, carbohydrate, and dietary fiber.

Next, characteristics of each index are described.

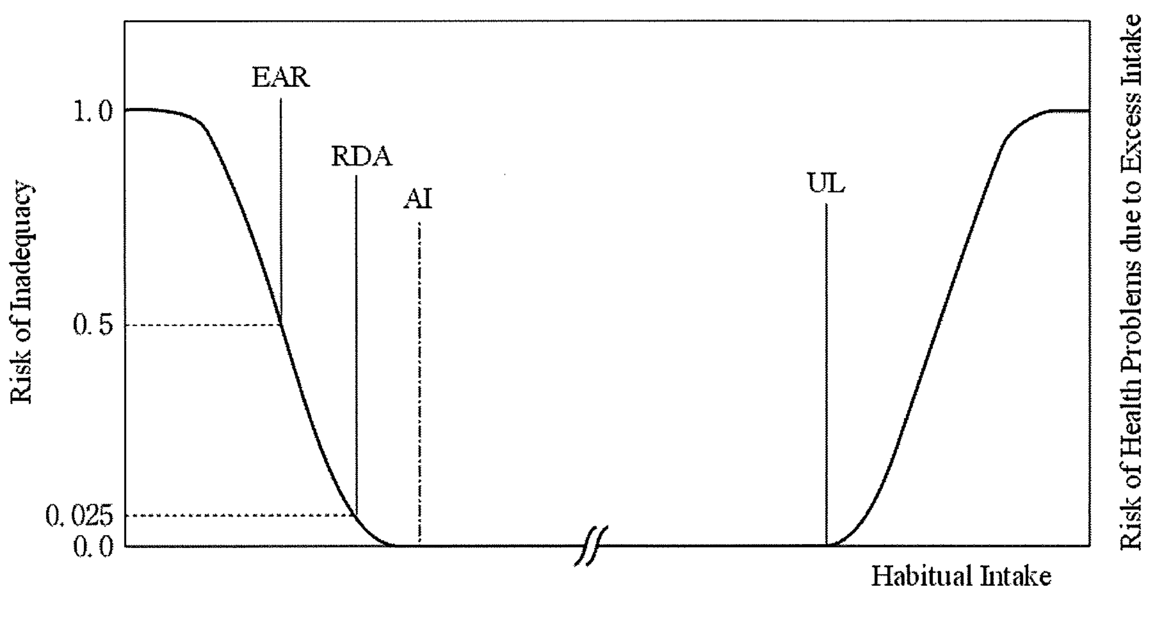


**Figure 2 Model illustrating indices for DRIs-J**
EAR, Estimated Average Requirement; RDA, Recommended Daily Allowance; AI, Adequate Intake; UL, Tolerable Upper Intake Level

**Table 1 Concepts of Indices and Characteristics of Nutrients**

| Objectives | Prevention of inadequacy | Prevention of health problems due to excessive intake | Primary Prevention of Lifestyle-related diseases |
|---|---|---|---|
| Indices | EAR, RDA, AI | UL | DG |
| Main methods, laboratory studies, and epidemiology studies for establishing evidence | laboratory studies, epidemiology studies (including interventional studies) | Case reports | Epidemiology studies (including interventional studies) |
| Importance of certain nutrients regarding targeted health problems | Important | Important | Non-constant due to many other related environmental factors |
| Typical period associated with health problems | Several months | Several months | Several years to several decades |
| Number of reports on target health problems | Very few to many | Very few to few | Many |
| Possibility of developing targeted health problems from usual food intake | Yes | Very few | Yes |
| Possibility of developing targeted health problems from supplementary intake | Yes (supplements include only certain nutrients) | Yes (particular attention needed) | Yes (supplements include only certain nutrients) |
| Need to consider established values | Consider where possible (depending on prevention needs) | Must be considered | Consider along with various related factors |
| Possibility of developing target health problems at established intakes | Low possibility when intake is around RDA or AI | Very low possibility when intake is below UL but not totally deniable | Yes (caused by other related factors) |

EAR: Estimated average requirement; RDA: Recommended dietary allowance; AI: adequate intake; UL: tolerable upper intake level; DG: tentative dietary goal for preventing life-style related diseases

3-2-2. Estimated average requirement

The Estimated Average Requirement (EAR) is adopted as the index of the estimated mean requirement in a population based on the calculated requirement of a study group. It is the estimated intake which will meet the requirements of 50-% of the group (and is hence insufficient for the other 50%).

"Inadequacy" here does not necessarily refer to development of classical deficiency; the definition varies with each nutrient. Refer to chapters on nutrients for specific definitions.

**Table 2 Nutrients with established DRIs and indices (ages 1 year and over)[1]**

| Nutrients | | | EAR | RDA | AI | UL | DG |
|---|---|---|---|---|---|---|---|
| Protein | | | ○ | ○ | — | — | — |
| Lipids | | Total fats | — | — | — | — | ○ |
| | | Saturated fatty acids | — | — | — | — | ○ |
| | | n-6 fatty acids | — | — | ○ | — | ○ |
| | | n-3 fatty acids | — | — | ○ | — | ○ |
| | | Cholesterol | — | — | — | — | ○ |
| Carbohydrates | | Carbohydrates | — | — | — | — | ○ |
| | | Dietary fibers | — | — | — | — | ○ |
| Vitamin | Oil-soluble vitamins | Vitamin A | ○ | ○ | — | ○ | — |
| | | Vitamin D | — | — | ○ | ○ | — |
| | | Vitamin E | — | — | ○ | ○ | — |
| | | Vitamin K | — | — | ○ | — | — |
| | Water-soluble vitamins | Vitamin $B_1$ | ○ | ○ | — | — | — |
| | | Vitamin $B_2$ | ○ | ○ | — | — | — |
| | | Niacin | ○ | ○ | — | ○ | — |
| | | Vitamin $B_6$ | ○ | ○ | — | ○ | — |
| | | Vitamin $B_{12}$ | ○ | ○ | — | — | — |
| | | Folic acid | ○ | ○ | — | ○[2] | — |
| | | Pantothenic acid | — | — | ○ | — | — |
| | | Biotin | — | — | ○ | — | — |
| | | Vitamin C | ○ | ○ | — | — | — |
| Minerals | Macro | Sodium | ○ | — | — | — | ○ |
| | | Potassium | — | — | ○ | — | ○ |
| | | Calcium | ○ | ○ | — | ○ | — |
| | | Magnesium | ○ | ○ | — | ○[2] | — |
| | | Phosphorus | — | — | ○ | ○ | — |
| | Micro | Iron | ○ | ○ | — | ○ | — |
| | | Zinc | ○ | ○ | — | ○ | — |
| | | Copper | ○ | ○ | — | ○ | — |
| | | Manganese | — | — | ○ | ○ | — |
| | | Iodine | ○ | ○ | — | ○ | — |
| | | Selenium | ○ | ○ | — | ○ | — |
| | | Chromium | ○ | ○ | — | — | — |
| | | Molybdenum | ○ | ○ | — | ○ | — |

EAR: Estimated average requirement; RDA: Recommended dietary allowance; AI: Adequate intake; UL: Tolerable upper intake level; DG: Tentative dietary goal for preventing life-style related diseases

[1] Including when the DRIs-J were defined only for certain age groups.

[2] Defined as intake other than from normal food.

### 3-2-3. Recommended Dietary Allowance

The Recommended Dietary Allowance (RDA) was established based on analyzed requirements for a subject group as the value that meets requirement of nearly all (97 to 98%) of the

**Table 3 Coefficients of variation for person-to-person variations used to estimate the Recommended Dietary Allowance from Estimated Average Requirements**

| Variation coefficient | Coefficient for calculating RDA | Nutrients |
|---|---|---|
| 10.0% | 1.2 | Vitamin $B_1$, vitamin $B_2$, niacin, vitamin $B_6$, vitamin $B_{12}$,folic acid, vitamin C, calcium, magnesium, iron (for adults and 15-17 years old) , zinc, selenium, chromium, molybdenum |
| 12.5% | 1.25 | Proteins |
| 15.0% | 1.3 | Copper |
| 20.0% | 1.4 | Vitamin A, iron (for 6 months-14 years old) , iodine |

population. RDAs are calculated theoretically as the mean values of EAR+2×SD from the EAR, taking the standard deviation observed between individuals in laboratory studies to approximate that of the population. In practice, however, the SD of EAR is rarely obtained correctly through laboratory studies. Therefore in most cases, estimated values are used. The variation coefficients (SD/mean) used in this edition to calculate RDA are listed in Table 3.

$$RDA = EAR\times(1+2\times SD) = EAR \times \text{variation coefficient of EAR.}$$

3-2-4. Adequate intake

The Adequate Intake (AI) is defined as intake which is enough to maintain a certain nutrient level in a particular population. In fact, it is the value at which there are nearly no undernourished individuals observed the population. AI is used only when the RDA is unavailable. Basically it is based on epidemiology studies observing the nutritional intake of a healthy population.

AI is based on any of the three concepts listed below, depending on nutrients, gender, or age group.

1) Estimated intake levels showing nearly no deficiency based on studies conducting health checks using biological or other indices together with a survey on nutrition. When nearly no subject in a group showed deficiency, median intake levels were used.
2) No health checks by biological or other indices were available but representative nutrient distributions of Japanese people were obtained.
3) Based on the intake level of healthy human milk-fed infants. Nutritional content and intake volume of human milk is used.

3-2-5. Tolerable upper intake level

The Tolerable Upper Intake Level (UL) is defined as the upper limit of the habitual intake that is considered to have no risk of causing health problems due to excessive intake. Health problems in this section refer to those due to excessive intake and do not include those due to inadequacy.

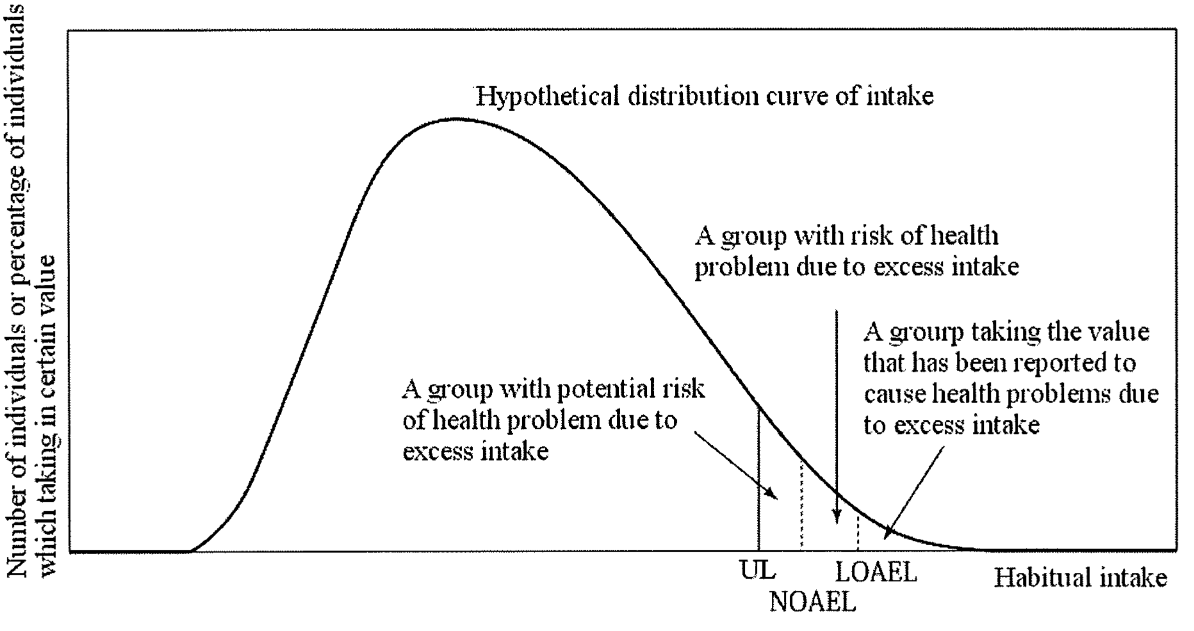


**Figure 3 Model of risk of health problems due to excessive intake**
The curve shows hypothetical intake distribution in a group. The vertical axis shows frequency or proportion of individuals in the group at a given intake. Those with intake above the UL have potential risk of developing health problems as a result; those with intake over LOAEL are above a level reported to cause health problems.
LOAEL: Lowest observed adverse effect level; NOAEL: No observed adverse effect level

The true tolerable upper intake level is, theoretically, the maximum amount with no adverse effect observed in human studies (no observed adverse effect level, NOAEL, Figure 3). Due to limited availability of human studies on NOAEL and the fact such studies are conducted on isolated groups, the UL used in practice is taken as the NOAEL divided by an Uncertainty Factor (UF), selected in the range 1 - 5 depending on conditions.

When the minimum amount known to cause adverse effects (lowest observed adverse effect level, LOAEL) based on studies of particular groups with excessive intake or use of supplements, the UF is basically 10 and the NOAEL is estimated as the LOAEL divided by 10. However, considering the occurrence of adverse effect of excessive intake of calcium, magnesium, and zinc, their ULs were set lower.

However adverse effects due to excessive intake in humans are rarely reported, it is impossible to conduct human studies to establish NOAELs and LOAEL and their relationships. Therefore, NOAEL or LOEAL need to be estimated based on data collected from animal or in some cases in vitro studies. When only LOEAL is available, NOAEL is estimated by LOEAL divided by a UF of 10, estimated based on animal studies.

There is not enough scientific basis for the UF and it has not reached a settlement among

**Table 4 Uncertain factor UF used for calculation of tolerable upper intake level UL**

| UF | Nutrients |
|---|---|
| 1 | Vitamin E, copper, manganese, iodine (infants) |
| 1. 2 | Vitamin D (adults) , calcium, phosphorus |
| 1. 5 | Vitamin A (pregnant women) ,zinc, iodine (adults) |
| 1. 8 | Vitamin D (infants) |
| 2 | Molybdenum |
| 3 | Folic acid, selenium |
| 5 | Vitamin A (adults) , niacin, vitamin $B_6$ |
| 10 | Vitamin A (infants) |
| 30 | Iron |

professionals. Consequently, as described above, an appropriate value for UF was selected in the range 1 - 5 for reports based on humans, and 10 for those based on animals. When NOAEL is used for computation, a lower UF is chosen; when LOAEL is used, a higher UF is selected. The UF is also determined by considering the characteristics of each nutrient, the severity of the illness caused by excessive intake, the quality and number of the studies reporting NOAEL and LOAEL, characteristics of the subject and subject group (sex, age and health status), representatives of the group, and the number of subjects needed to establish UL. UFs used in the computation are listed in Table 4 for nutrients that have UL.

The details for computing UL differ for each nutrient and it is suggested to refer to the detailed information chapters. For some nutrients, reports offering a solid basis for computation were scarce and computation was postponed.

3-2-6. Tentative dietary goal for preventing lifestyle-related diseases

For the purpose of primary prevention of lifestyle-related disease, the Tentative Dietary Goal for Preventing Lifestyle-related Diseases (DG) is designed as a set of target intakes for modern Japanese to achieve a nutrition reducing the risk of disease or biological markers representing illness in a particular group. It is based on epidemiological studies with input from experimental nutritional studies. However, the relationship between nutritional intake and risk of developing lifestyle-related diseases is continuous in nature and quite often there is no threshold. In such cases, it is difficult to propose an optimum quantity or threshold; practicality was then used as the key factor to determine the desirable intake, also taking dietary preferences in other countries, and the intake, dietary composition and preferences of modern Japanese people into consideration.

In this edition, particular emphasis was placed on the primary prevention of cardiovascular