

DESCRIPTION

DIETARY DIVERSITY DETERMINING APPARATUS, SHEET, DIETARY DIVERSITY DETERMINING METHOD, AND RECORDING MEDIUM

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Technical Field

[0001] The present invention relates to a dietary diversity determining apparatus and the like for determining whether or not diverse diets are consumed.

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Background Art

[0002] It has been reported that there is a positive association between consumption of diverse food groups and health maintenance. The following conventional techniques have contributed to consumption of diverse food groups.

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[0003] Conventionally, there has been a meal recording system for tallying energy intake values and nutritional balance status by registering meal records as record data (see Patent Document 1).

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[0004] Furthermore, conventionally, there has been a method for preparing a menu for one meal that includes a staple meal, main dish, side dishes, and the like, wherein the menu for one meal satisfies a predetermined nutritional balance and individual menu items that make up each menu component can be easily determined (see Patent Document 2).

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[0005] Furthermore, conventionally, there has been a meal content analyzer that can more accurately evaluate meal balance by increasing the accuracy of analyzing meal content from meal images (see Patent Document 3).

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[0006] Moreover, conventionally, there has been a food operator assistance system using a database in which reference value information indicating a range of an appropriate amount for each nutrition of a meal is stored, including: a meal information input unit that collects meal information

including a nutritional intake of a meal, and accepts input of unit price information of the meal; an index calculating unit that calculates individual nutritional scores as continuous values using a function that changes according to a range of an appropriate amount of the reference value
5 information taking the nutritional intake as a variable, and calculates a nutrition balance score by integrating the individual nutritional scores; and a target condition setting unit that sets a target value of a nutrition balance score using the nutrition balance score obtained by the index calculating unit and the unit price of a meal.

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Citation List

Patent Document

[0007] Patent Document 1: JP 2009-282722A

Patent Document 2: JP 2019-82808A

15 Patent Document 3: JP 2021-18567A

Patent Document 4: Japanese Patent No. 6064046

Summary of Invention

Technical Problem

20 [0008] However, according to conventional techniques, it is not possible to accurately and easily acquire the degree of dietary diversity.

Solution to Problem

[0009] A first aspect of the present invention is directed to a dietary
25 diversity determining apparatus including: a lower limit storage unit in which lower limit information for specifying an appropriate intake lower limit amount for each of two or more food groups is stored; a presentation information output unit that outputs two or more pieces of presentation information each in a manner in which lower limit information is associated
30 with a food group identifier for identifying a food group corresponding to the

lower limit information; a response accepting unit that accepts response information for specifying whether or not food groups respectively corresponding to the two or more pieces of presentation information have been consumed in amounts greater than or equal to those specified by lower
5 limit information respectively corresponding to the two or more pieces of presentation information; a score acquiring unit that acquires a diversity score, which is a score regarding dietary diversity, using the response information accepted by the response accepting unit; and a score output unit that outputs the diversity score acquired by the score acquiring unit.

10 [0010] By utilizing this configuration, a diversity score is acquired using response information for specifying whether or not each of two or more food groups has been consumed in an amount greater than or equal to an appropriate intake lower limit amount, and thus it is possible to accurately and easily acquire the degree of dietary diversity. Note that, in the case of
15 using response information for simply specifying whether or not each of two or more food groups has been consumed, consumption even in a very small amount will be treated as if it were appropriate consumption, and thus it is not possible to acquire an accurate diversity score.

[0011] Furthermore, a second aspect of the present invention is directed to
20 the dietary diversity determining apparatus according to the first aspect, wherein the score acquiring unit acquires a diversity score based on the number of food groups consumed in an amount greater than or equal to that specified by lower limit information.

[0012] By utilizing this configuration, it is possible to accurately and easily
25 acquire the degree of dietary diversity.

[0013] Furthermore, a third aspect of the present invention is directed to the dietary diversity determining apparatus according to the second aspect, wherein the two or more food groups are 10 food groups.

[0014] By utilizing this configuration, it is possible to accurately and easily
30 acquire the degree of dietary diversity.

[0015] Furthermore, a fourth aspect of the present invention is directed to the dietary diversity determining apparatus according to any one of the first to third aspects, wherein lower limit information for each of two or more food groups is stored in the lower limit storage unit in association with two or more user conditions using one or more user attribute values, the dietary diversity determining apparatus further includes: an instruction accepting unit that accepts an output instruction, which is an instruction associated with one or more user attribute values and is an instruction to output two or more pieces of presentation information; and a presentation information acquiring unit that acquires lower limit information for each of two or more food groups corresponding to a user condition that is met by one or more user attribute values associated with the output instruction, from the lower limit storage unit, and acquires two or more pieces of presentation information each in a manner in which a food group identifier for identifying a food group corresponding to the lower limit information is associated with the lower limit information, and the presentation information output unit outputs the two or more pieces of presentation information acquired by the presentation information acquiring unit.

[0016] By utilizing this configuration, it is possible to accurately and easily acquire the degree of dietary diversity according to a user attribute value.

[0017] Furthermore, a fifth aspect of the present invention is directed to the dietary diversity determining apparatus according to the fourth aspect, wherein the one or more user attribute values include a race identifier for identifying a race of a user, a residence identifier for identifying a place of residence of a user, a food culture identifier for identifying a food culture, or overall amount information on the overall amount of food intake in a user.

[0018] By utilizing this configuration, it is possible to accurately and easily acquire the degree of dietary diversity according to an appropriate user attribute value.

[0019] Furthermore, a sixth aspect of the present invention is directed to the

dietary diversity determining apparatus according to any one of the first to fifth aspects, further including: a risk storage unit in which risk information on a risk to a person is stored in association with a diversity score; a risk acquiring unit that acquires risk information corresponding to a diversity score output by the score output unit, from the risk storage unit; and a risk output unit that outputs the risk information acquired by the risk acquiring unit.

[0020] By utilizing this configuration, it is possible to notify a user of a risk corresponding to a diversity score.

[0021] Furthermore, a seventh aspect of the present invention is directed to the dietary diversity determining apparatus according to the sixth aspect, wherein, in the risk storage unit, two or more pieces of risk information are stored, and a pair of risk information on one of two or more risks and degree information for specifying a degree to which the risk is likely to occur is stored in association with a diversity score, the risk acquiring unit acquires risk information and degree information that correspond to a diversity score output by the score output unit, from the risk storage unit, and the risk output unit outputs the risk information and the degree information acquired by the risk acquiring unit.

[0022] By utilizing this configuration, it is possible to notify a user of a risk corresponding to a diversity score and a degree to which the risk is likely to occur.

[0023] Furthermore, an eighth aspect of the present invention is directed to the dietary diversity determining apparatus according to any one of the first to seventh aspects, further including: an advice storage unit in which advice information associated with an advice condition using a diversity score and one or more pieces of response information is stored; an advice acquiring unit that acquires advice information corresponding to an advice condition that is met by a diversity score output by the score output unit and one or more pieces of response information accepted by the response accepting unit, from

the advice storage unit; and an advice output unit that outputs the advice information acquired by the advice acquiring unit.

[0024] By utilizing this configuration, it is possible to provide a user with appropriate advice corresponding to a diversity score.

5 [0025] Furthermore, a ninth aspect of the present invention is directed to the dietary diversity determining apparatus according to any one of the first to eighth aspects, wherein the response accepting unit accepts a set of two or more pieces of response information on different days from one user, and the dietary diversity determining apparatus further includes: a statistical
10 processing unit that performs statistical processing on the set of two or more pieces of response information, thereby acquiring a statistical processing result; and a statistical output unit that outputs the statistical processing result acquired by the statistical processing unit.

[0026] By utilizing this configuration, a user is notified of a result of
15 performing statistical processing on response information for two or more days, and thus it is possible to make a contribution to the user's health.

[0027] Furthermore, a tenth aspect of the present invention is directed to a sheet including two or more pieces of presentation information each in a manner in which a food group identifier for identifying a food group is
20 associated with lower limit information for the food group, and a field that accepts input of response information for each of the two or more pieces of presentation information.

[0028] By utilizing this configuration, it is possible to provide a sheet that makes it possible to accurately and easily acquire the degree of dietary
25 diversity.

Advantageous Effects of Invention

[0029] With the dietary diversity determining apparatus according to the present invention, it is possible to accurately and easily acquire a diversity
30 score indicating the degree of dietary diversity.

Brief Description of Drawings

[0030] FIG. 1 is a conceptual diagram of a determination system A in Embodiment 1.

5 FIG. 2 is a block diagram of the determination system A in this embodiment.

FIG. 3 is a flowchart illustrating an operation example of a dietary diversity determining apparatus 1 in this embodiment.

10 FIG. 4 is a flowchart illustrating an example of screen information acquisition processing in this embodiment.

FIG. 5 is a flowchart illustrating an example of risk information acquisition processing in this embodiment.

FIG. 6 is a flowchart illustrating an example of advice information acquisition processing in this embodiment.

15 FIG. 7 is a flowchart illustrating an example of statistical processing in this embodiment.

FIG. 8 is a diagram showing an example of template information of response input screen information in this embodiment.

20 FIG. 9 is a diagram showing a lower limit information management table in this embodiment.

FIG. 10 is a diagram showing a risk information management table in this embodiment.

FIG. 11 is a diagram showing an advice information management table in this embodiment.

25 FIG. 12 is a diagram showing an example of a response input screen in this embodiment.

FIG. 13 is a diagram showing an output example in this embodiment.

FIG. 14 is a diagram showing a screen example in this embodiment.

30 FIG. 15 is a diagram showing an output example of a statistical processing result and the like in this embodiment.

FIG. 16 is a schematic view of a computer system in this embodiment.

FIG. 17 is a block diagram of the computer system in this embodiment.

FIG. 18 is a diagram showing the backgrounds of subjects in this
5 embodiment.

FIG. 19 shows diagrams of QUANTIDD correlations calculated from different numbers of food groups in this embodiment.

FIG. 20 shows diagrams of QUANTIDD conversion tables calculated from different numbers of food groups in this embodiment.

10 FIG. 21 shows diagrams of correlations between QUANTIDD and the number of food groups consumed at different lower limit values in this embodiment.

FIG. 22 is a diagram showing a graph for different conditions under which a food group is considered to have been consumed in this embodiment.

15 FIG. 23 is a diagram showing a table from which FIG. 22 was obtained.

Description of Embodiment

[0031] Hereinafter, an embodiment of a dietary diversity determining
20 apparatus and the like will be described with reference to the drawings. The constituent elements denoted by the same reference numerals in the embodiments perform similar operations, and thus a description thereof may not be repeated.

25 Embodiment 1

[0032] In this embodiment, a determination system including a dietary diversity determining apparatus will be described, the dietary diversity determining apparatus being an apparatus that, in a state in which information indicating an intake lower limit value is stored for each of N or
30 more food groups (N is two or more), outputs lower limit information for

specifying an intake lower limit amount, in association with each food group identifier, accepts, for each food group, response information for specifying whether or not consumption has been made in an amount greater than the intake lower limit amount, acquires a dietary diversity score using the response information, and outputs the score.

[0033] Furthermore, in this embodiment, a determination system including a dietary diversity determining apparatus will be described, the dietary diversity determining apparatus being an apparatus that outputs different intake lower limit amounts according to accepted user attribute values.

[0034] Furthermore, in this embodiment, a determination system including a dietary diversity determining apparatus will be described, the dietary diversity determining apparatus being an apparatus that acquires information on a risk, using a diversity score and the like, and outputs the information.

[0035] Furthermore, in this embodiment, a determination system including a dietary diversity determining apparatus will be described, the dietary diversity determining apparatus being an apparatus that acquires advice, using a diversity score, response information, and the like, and outputs the advice.

[0036] Furthermore, in this embodiment, a determination system including a dietary diversity determining apparatus will be described, the dietary diversity determining apparatus being an apparatus that performs statistical processing on response information for two or more days, and outputs a statistical processing result.

[0037] FIG. 1 is a conceptual diagram of a determination system A in this embodiment. The determination system A includes a dietary diversity determining apparatus 1 and one or two or more user terminals 2.

[0038] The dietary diversity determining apparatus 1 is an apparatus that acquires and outputs a diversity score. The dietary diversity determining apparatus 1 in this example is typically a so-called server, but may be an

apparatus that operates alone. The dietary diversity determining apparatus 1 is, for example, a cloud server, an ASP server, or the like. There is no limitation on the type of dietary diversity determining apparatus 1. If the dietary diversity determining apparatus 1 is a stand-alone apparatus, the user terminals 2 are not necessary.

[0039] The user terminals 2 are terminals that are used by users. The user terminals 2 accept response information, and output diversity scores acquired using the response information. The user terminals 2 are, for example, so-called personal computers, tablet devices, smartphones, or the like, and there is no limitation on the type thereof.

[0040] The dietary diversity determining apparatus 1 and the one or more user terminals 2 can communicate with each other via a network such as the Internet.

[0041] FIG. 2 is a block diagram of the determination system A in this embodiment. The dietary diversity determining apparatus 1 constituting the determination system A includes a storage unit 11, an accepting unit 12, a processing unit 13, and an output unit 14. The storage unit 11 includes a lower limit storage unit 111, a risk storage unit 112, and an advice storage unit 113. The accepting unit 12 includes an instruction accepting unit 121 and a response accepting unit 122. The processing unit 13 includes a presentation information acquiring unit 131, a score acquiring unit 132, a risk acquiring unit 133, an advice acquiring unit 134, and a statistical processing unit 135. The output unit 14 includes a presentation information output unit 141, a score output unit 142, a risk output unit 143, an advice output unit 144, and a statistical output unit 145.

[0042] Each user terminal 2 includes a terminal storage unit 21, a terminal accepting unit 22, a terminal processing unit 23, a terminal transmitting unit 24, a terminal receiving unit 25, and a terminal output unit 26.

[0043] Various types of information are stored in the storage unit 11 constituting the dietary diversity determining apparatus 1. The various

types of information are, for example, later-described lower limit information, later-described risk information, later-described advice information, a later-described risk condition, a later-described advice condition, a later-described user condition, or later-described various types of screen information.

5 [0044] Two or more pieces of lower limit information are stored in the lower limit storage unit 111. The two or more pieces of lower limit information are information for respectively specifying appropriate intake lower limit amounts for different food groups. The two or more food groups are, for example, grains, potatoes, beans, seeds, vegetables (green and yellow
10 vegetables and other vegetables), mushrooms, seaweeds, fruits, eggs, seafoods, meats, milk and milk products (dairy products), sugar and sweeteners, confectioneries, fats and oils, or seasonings. The two or more food groups are preferably 10 food groups. The 10 food groups are, for example, grains, potatoes, beans, green and yellow vegetables, other
15 vegetables (including mushrooms and seaweeds), fruits, eggs, seafoods, meats, and dairy products. The reason why 10 food groups are preferable is that the user only needs to input response information for 10 food groups, which is a small number, in the case of acquiring a later-described diversity score, and a diversity score can be obtained by simply adding ten pieces of
20 response information, making it easy for the user to understand the significance of the diversity score, for example.

[0045] A set of lower limit information for two or more food groups in the lower limit storage unit 111 is preferably associated with a user condition. The user condition is a condition using one or more user attribute values.
25 That is to say, the lower limit information for at least one or more of the two or more food groups preferably varies according to the one or more user attribute values.

[0046] The one or more user attribute values are, for example, a race identifier, a residence identifier, a food culture identifier, overall amount
30 information, sex information, or age information. The race identifier is

information for identifying a race of a user, and is, for example, Black, White, Yellow, Western, Japanese, American, or Asian. The overall amount information is information on the overall amount of food a user usually consumes, and is, for example, “eats a lot”, “normal”, “eats a little”, or the like. The sex information is, for example, “male” or “female”. The age information is, for example, age or generation (20s, 60s, 65 and over, etc.).

[0047] Two or more pieces of presentation information may be stored in the lower limit storage unit 111. The presentation information is information in a manner in which a food group identifier for identifying a food group is associated with lower limit information for the food group. The presentation information is, for example, information having a food group identifier and lower limit information.

[0048] Screen information containing two or more pieces of lower limit information may be stored in the lower limit storage unit 111. Screen information containing two or more pieces of presentation information may be stored in the lower limit storage unit 111. The screen information in this example is, for example, response input screen information or input explanation screen information. The screen information is realized by, for example, HTML, XML, or the like, but may be realized by any method.

[0049] The response input screen information is screen information for configuring a response input screen. The response input screen information is information for configuring a screen to which response information of a user is to be input. The response input screen information is information for configuring a screen having two or more pieces of presentation information and fields respectively corresponding to the two or more pieces of presentation information.

[0050] A field in this example is a user interface part that accepts input of response information. The field in this example is, for example, a text box to which text is to be input, a check box to which a check mark is to be input, a user interface part to which “Yes” or “No” is to be input, a user interface part

to which “Yes” is to be input, or a user interface part to which “No” is to be input. The field may be any user interface part to which response information for specifying whether or not a food group has been consumed in an amount greater than or equal to that specified by lower limit information

5 can be input, and there is no limitation on the type thereof.

[0051] The input explanation screen information does not have a field to which response information is to be input, but is information on a screen that provides an explanation to assist the user in inputting response information. The input explanation screen information contains a set of two or more pieces

10 of presentation information.

[0052] The lower limit information is information for specifying an appropriate intake lower limit amount for a food group. The lower limit information is, for example, text (e.g., 5% of the food intake, 1.5% of the food intake, 1/2 pieces, 1 piece, 1 cup, 1/2 glass, 3 chunks, or 2 slices), an image

15 that allows a person to visualize the intake lower limit amount, or a combination of the text and the image. The text preferably contains information for identifying a food item and information for specifying an amount. The text is preferably, for example, text with an expression that allows a person to easily visualize the amount, such as “about the amount in

20 the palm of one hand” or “about the amount that can be held in the palm of one hand”.

[0053] Furthermore, for example, the lower limit information corresponding to the food group identifier “green and yellow vegetables” is “tomato: 5%” or “tomato: 1/2”. For example, the lower limit information corresponding to the

25 food group identifier “other vegetables” is “onion: 5%” or “onion: 1/2”. For example, the lower limit information corresponding to the food group identifier “fruits” is “orange: 5%” or “orange: 1”. For example, the lower limit information corresponding to the food group identifier “dairy products” is “yogurt: 5%”, “milk: 5%”, “yogurt: 1 cup”, or “milk: 1/2 glass”. For example,

30 the lower limit information corresponding to the food group identifier

“potatoes” is “sweet potato: 1.5%” or “sweet potato: 3 chunks”. For example, the lower limit information corresponding to the food group identifier “beans” is “*natto*: 1.5%”, “*natto*: 1 cup”, “*tofu miso* soup: 1.5%”, or “*tofu miso* soup: 1 cup”. For example, the lower limit information corresponding to the food group identifier “seafoods” is “*sashimi*: 1.5%” or “*sashimi*: 2 slices”. For example, the lower limit information corresponding to the food group identifier “meats” is “thin-sliced loin: 1.5%” or “thin-sliced loin: 1/2”. For example, the lower limit information corresponding to the food group identifier “eggs” is “egg: 1.5%” or “egg: 1/2”. The percentage (1.5%, 5%, etc.) is the percentage with respect to the total food intake.

[0054] One or two or more pieces of risk information are stored in the risk storage unit 112. The risk information is information on the risk to a person. The risk information is, for example, information for specifying the risk of a disease. The risk information is, for example, information on the risk of cognitive decline, information on the risk of dementia, information on the risk of atrophy of the brain (the hippocampus etc.), information on the risk of sarcopenia or frailty, information on the risk of developing mood disorders, or information on the risk of cardiovascular system diseases.

[0055] The risk information has a risk identifier for specifying the nature of the risk (e.g., “cognitive decline” or “hippocampal atrophy”). The risk information may have degree information for specifying a degree to which the risk is likely to occur. The risk information is typically text, but may be a still image, a moving image, or a sound with which the nature of the risk can be identified, and there is no limitation on the data type thereof.

[0056] The risk information is, for example, associated with a risk condition. The risk condition is a condition for acquiring risk information. The risk condition is, for example, a condition using a diversity score. The risk condition is, for example, a condition indicating the range of a diversity score. The risk condition is, for example, a condition using a diversity score or one or two or more pieces of response information, or a condition using one or two or

more of a statistical processing result of a diversity score and a statistical processing result of two or more pieces of response information.

[0057] Advice information associated with each of one or more pieces of advice condition is stored in the advice storage unit 113. The advice
5 condition is a condition using a diversity score. The advice condition is preferably a condition using a diversity score and one or more pieces of response information.

[0058] The advice condition is, for example, that all pieces of response information corresponding to “diversity score ≤ 8 & one or two or more
10 specific food group identifiers (e.g., “green and yellow vegetables” and “other vegetables”) are “No (not consumed)” and “diversity score ≤ 5 ”.

[0059] The advice information is information on advice for improving a diet of a user. The advice information is, for example, the text “First, consume at
15 least the standard amount of vegetables”, “You should review the overall balance of your diet”, or the like, but may be a still image, a moving image, or a sound with which the content of the advice can be identified, and there is no limitation on the data type thereof.

[0060] The accepting unit 12 accepts various types of information and instructions. The various types of information and instructions are, for
20 example, a later-described output instruction or later-described response information. In this example, the accepting is typically receiving from the user terminals 2, but may be a concept that encompasses accepting information input from an input device such as a keyboard, a mouse, or a touch panel, or accepting information read from a recording medium such as
25 an optical disk, a magnetic disk, or a semiconductor memory.

[0061] The instruction accepting unit 121 accepts various instructions. The various instructions are, for example, an output instruction or a statistical instruction.

[0062] The output instruction is, for example, an instruction associated with
30 one or more user attribute values and is an instruction to output two or more

pieces of presentation information. The instruction to output two or more pieces of presentation information may be an instruction to output the above-described response input screen information or input explanation screen information. The output instruction has, for example, a user identifier.

- 5 The user identifier is information for identifying a user. The user identifier is, for example, an ID, a name, an e-mail address, or an identifier (e.g., an IP address or a MAC address) of a user terminal 2.

[0063] The statistical instruction is an instruction to perform statistical processing. The statistical instruction has, for example, a user identifier.

- 10 The statistical instruction has, for example, period information. The period information is information for specifying a period of response information that is used when performing statistical processing. The statistical instruction may have a set of response information for two or more days.

Such a set of response information is typically subjected to statistical

- 15 processing.

[0064] The response accepting unit 122 accepts response information. The response accepting unit 122 typically accepts two or more pieces of response information. The response accepting unit 122 accepts, for example, response information for each of 10 food groups. The response accepting unit 122

- 20 preferably accepts a set of two or more pieces of response information on different days from one user. The response accepting unit 122 preferably accepts a set of two or more pieces of response information from each of two or more users.

[0065] The response information is information for specifying whether or not

- 25 food groups respectively corresponding to the two or more pieces of presentation information have been consumed in amounts greater than or equal to those specified by lower limit information respectively corresponding to the two or more pieces of presentation information. The state in which a food group has been consumed in an amount greater than or equal to that
30 specified by lower limit information may be replaced by a state in which the

food group has been consumed in an amount greater than that specified by the lower limit information.

[0066] The processing unit 13 performs various types of processing. The various types of processing are, for example, processing that is performed by
5 the presentation information acquiring unit 131, the score acquiring unit 132, the risk acquiring unit 133, the advice acquiring unit 134, or the statistical processing unit 135.

[0067] The presentation information acquiring unit 131 acquires two or more pieces of presentation information. The presentation information is
10 information in a manner in which a food group identifier is associated with lower limit information. The associated manner is, for example, a manner in which they are horizontally arranged side by side, a manner in which they are vertically arranged one on the top of the other, a manner in which they are adjacent to each other, or the like, and it may be any manner that enables
15 the user to recognize the correspondence.

[0068] The presentation information acquiring unit 131 acquires lower limit information for each of two or more food groups, from the lower limit storage unit 111, and acquires two or more pieces of presentation information each in a manner in which a food group identifier for identifying a food group
20 corresponding to the lower limit information is associated with the lower limit information.

[0069] The presentation information acquiring unit 131 acquires, for example, two or more pieces of presentation information from the lower limit storage unit 111 in response to receipt of an output instruction.

25 [0070] The presentation information acquiring unit 131 acquires, for example, response input screen information or input explanation screen information from the lower limit storage unit 111 in response to receipt of an output instruction.

[0071] The presentation information acquiring unit 131 acquires, for
30 example, lower limit information for each of two or more food groups

corresponding to a user condition that is met by one or more user attribute values associated with the output instruction, from the lower limit storage unit 111, and acquires two or more pieces of presentation information each in a manner in which a food group identifier for identifying a food group
5 corresponding to the lower limit information is associated with the lower limit information.

[0072] The presentation information acquiring unit 131 acquires, for example, two or more pieces of presentation information corresponding to a user condition that is met by one or more user attribute values associated
10 with the output instruction, from the lower limit storage unit 111.

[0073] The presentation information acquiring unit 131 acquires, for example, response input screen information or input explanation screen information corresponding to a user condition that is met by one or more user attribute values associated with the output instruction, from the lower limit
15 storage unit 111.

[0074] The presentation information acquiring unit 131 may acquire, for example, lower limit information for each of two or more food groups corresponding to a user condition that is met by one or more user attribute values associated with the output instruction, from the lower limit storage
20 unit 111, and substitute the lower limit information for each of the two or more food groups for template information of response input screen information, thereby configuring response input screen information. In this case, the template information is screen information of a template for configuring response input screen information.

[0075] The presentation information acquiring unit 131 may acquire, for example, lower limit information for each of two or more food groups corresponding to a user condition that is met by one or more user attribute values associated with the output instruction, from the lower limit storage
25 unit 111, and substitute the lower limit information for each of the two or
30 more food groups for template information of input explanation screen

information, thereby configuring response input screen information. In this case, the template information is screen information of a template for configuring input explanation screen information.

[0076] The score acquiring unit 132 acquires a diversity score, which is a score regarding dietary diversity, using the response information accepted by the response accepting unit 122.

[0077] The score acquiring unit 132 acquires, for example, the number of food groups consumed in an amount greater than or equal to that specified by lower limit information, using the response information accepted by the response accepting unit 122, and acquires a diversity score based on the number. The score acquiring unit 132 acquires a diversity score of the number of food groups consumed in an amount greater than or equal to that specified by lower limit information. In this example, if the number of food groups subjected to response information (the number of all food groups) is 10, the diversity score is, for example, an integer from 0 to 10.

[0078] The risk acquiring unit 133 acquires risk information corresponding to a diversity score output by the score output unit 142, from the risk storage unit 112. The diversity score output by the score output unit 142 is a diversity score acquired by the score acquiring unit 132. The risk acquiring unit 133 may acquire risk information corresponding to a diversity score given from the score output unit 142, from the risk storage unit 112. For example, risk information and degree information that correspond to a diversity score output by the score output unit 142 are acquired from the risk storage unit 112.

[0079] The risk acquiring unit 133 may acquire risk information corresponding to a risk condition that is met by the diversity score output by the score output unit 142, from the risk storage unit 112. The risk acquiring unit 133 may acquire risk information corresponding to a risk condition that is met by one or two or more types of information out of the acquired diversity score, two or more pieces of response information, statistical processing result

of a diversity score, and statistical processing result of two or more pieces of response information, from the risk storage unit 112.

[0080] The advice acquiring unit 134 acquires advice information corresponding to an advice condition that is met by the diversity score output
5 by the score output unit 142, from the advice storage unit 113.

[0081] The advice acquiring unit 134 acquires, for example, advice information corresponding to an advice condition that is met by the diversity score output by the score output unit 142 and one or more pieces of response information accepted by the response accepting unit 122, from the advice
10 storage unit 113.

[0082] The advice acquiring unit 134 acquires, for example, advice information corresponding to an advice condition that is met by a diversity score given from the score output unit 142, from the advice storage unit 113.

[0083] The statistical processing unit 135 performs statistical processing on
15 a set of two or more pieces of response information on different days, thereby acquiring a statistical processing result.

[0084] The statistical processing unit 135 acquires, for example, a representative value of the diversity scores respectively acquired for the sets of two or more pieces of response information on different days. The
20 representative value is, for example, a mean value, a median value, a highest value, or a lowest value.

[0085] The statistical processing unit 135 acquires, for example, a food group identifier corresponding to response information indicating that a food group has “not been consumed” in an amount greater than or equal to a threshold or
25 in an amount greater than the threshold, in each set of two or more pieces of response information on different days.

[0086] The output unit 14 outputs various types of information. The various types of information are, for example, presentation information, response input screen information, input explanation screen information, a
30 diversity score, risk information, or advice information.

[0087] In this example, the output is typically transmission to the user terminals 2, but is a concept that encompasses display on a display screen, projection using a projector, printing by a printer, output of a sound, accumulation in a recording medium, delivery of a processing result to
5 another processing apparatus or another program, and the like.

[0088] The presentation information output unit 141 outputs two or more pieces of presentation information. The presentation information output unit 141 outputs the two or more pieces of presentation information acquired by the presentation information acquiring unit 131. The presentation
10 information output unit 141 may output the response input screen information acquired by the presentation information acquiring unit 131. The presentation information output unit 141 may output the input explanation screen information acquired by the presentation information acquiring unit 131.

15 [0089] The score output unit 142 outputs the diversity score acquired by the score acquiring unit 132.

[0090] The risk output unit 143 outputs the risk information acquired by the risk acquiring unit 133. The risk output unit 143 may output the risk information and the degree information that are acquired by the risk
20 acquiring unit 133.

[0091] The advice output unit 144 outputs the advice information acquired by the advice acquiring unit 134.

[0092] The statistical output unit 145 outputs the statistical processing result acquired by the statistical processing unit 135. The statistical
25 processing result is, for example, a representative value of diversity scores on two or more different days or a statistical processing result of a set of response information on two or more different days. The statistical processing result is, for example, a food group identifier corresponding to response information indicating that a food group has “not been consumed” in
30 an amount greater than or equal to a threshold or in an amount greater than

the threshold on two or more different days.

[0093] Various types of information are stored in the terminal storage unit 21 constituting each user terminal 2. The various types of information are, for example, one or more user attribute values or response information.

5 [0094] The terminal accepting unit 22 accepts various types of instructions and information. The various types of instructions and information are, for example, an output instruction, a statistical instruction, or response information.

[0095] The various types of instructions and information may be input by
10 any input part such as a numeric keypad, a keyboard, a mouse, or a menu screen.

[0096] The terminal processing unit 23 performs various types of processing. The various types of processing are, for example, processing that changes the instructions or information accepted by the terminal accepting unit 22 into
15 those with a structure suitable for transmission. The various types of processing are, for example, processing that changes the information received by the terminal receiving unit 25 into that with a structure suitable for output.

[0097] The terminal transmitting unit 24 transmits various types of
20 instructions and information to the dietary diversity determining apparatus 1. The various types of instructions and information are, for example, an output instruction, a statistical instruction, or response information.

[0098] The terminal receiving unit 25 receives various types of information. The various types of information are, for example, presentation information,
25 response input screen information, input explanation screen information, a diversity score, risk information, or advice information.

[0099] The terminal output unit 26 outputs various types of information. The various types of information are, for example, presentation information, a response input screen, an input explanation screen, a diversity score, risk
30 information, or advice information.

[0100] The storage unit 11, the lower limit storage unit 111, the risk storage unit 112, the advice storage unit 113, and the terminal storage unit 21 are preferably non-volatile recording media, but may alternatively be realized by volatile recording media.

5 [0101] There is no limitation on the procedure in which information is stored in the storage unit 11 and the like. For example, information may be stored in the storage unit 11 and the like via a recording medium, information transmitted via a communication line or the like may be stored in the storage unit 11 and the like, or information input via an input device may be stored
10 in the storage unit 11 and the like.

[0102] The accepting unit 12, the instruction accepting unit 121, the response accepting unit 122, and the terminal receiving unit 25 are typically realized by wireless or wired communication parts, but may alternatively be realized by broadcast receiving parts.

15 [0103] The processing unit 13, the presentation information acquiring unit 131, the score acquiring unit 132, the risk acquiring unit 133, the advice acquiring unit 134, the statistical processing unit 135, and the terminal processing unit 23 may be typically realized by processors, memories, or the like. Typically, the processing procedure of the processing unit 13 and the
20 like is realized by software, and the software is stored in a recording medium such as a ROM. However, the processing procedure may be realized by hardware (dedicated circuits). The processors are, for example, MPUs, CPUs, GPUs, or the like, and there is no limitation on the type thereof.

[0104] The output unit 14, the presentation information output unit 141, the
25 score output unit 142, the risk output unit 143, the advice output unit 144, the statistical output unit 145, and the terminal transmitting unit 24 are typically realized by wireless or wired communication parts, but may alternatively be realized by broadcasting parts.

[0105] The terminal accepting unit 22 may be realized by a device driver for
30 an input part such as a numeric keypad or a keyboard, control software for a

menu screen, or the like, for example.

[0106] The terminal output unit 26 may be considered to include or not to include an output device such as a display screen or a speaker. The terminal output unit 26 may be realized by driver software for an output device, a
5 combination of driver software for an output device and the output device, or the like.

[0107] Next, an operation example of the inspection system A will be described. First, an operation example of the dietary diversity determining apparatus 1 will be described with reference to the flowchart in FIG. 3.

10 [0108] (Step S301) The instruction accepting unit 121 determines whether or not it has accepted an output instruction. If it has accepted an output instruction, the procedure advances to step S302, or otherwise the procedure advances to step S311. In this example, the accepting an output instruction is, for example, receiving an output instruction from a user terminal 2.

15 [0109] (Step S302) The presentation information acquiring unit 131 acquires response input screen information corresponding to the output instruction accepted in step S301. An example of this screen information acquisition processing will be described with reference to the flowchart in FIG. 4. The response input screen information has presentation information.

20 [0110] (Step S303) The presentation information output unit 141 outputs the response input screen information acquired in step S302. In this example, the outputting response input screen information is, for example, transmitting the response input screen information to the user terminal 2.

[0111] (Step S304) The response accepting unit 122 determines whether or
25 not it has accepted response information corresponding to each of two or more food group identifiers from the user in response to output of the response input screen information. If it has accepted such response information, the procedure advances to step S305, or otherwise the procedure returns to step S304. The accepting response information from a user is, for example,
30 receiving the response information from the user terminal 2. In this

example, the response information is, for example, accepted in association with a user identifier. The accepted response information is typically response information on meals for one day.

5 [0112] (Step S305) The response accepting unit 122 accumulates each of the two or more pieces of response information, in the storage unit 11, in association with a user identifier and a food group identifier.

[0113] (Step S306) The score acquiring unit 132 acquires a diversity score using the two or more pieces of response information accepted in step S305. In this example, the score acquiring unit 132 preferably accumulates the
10 acquired diversity score in the storage unit 11 in association with a user identifier. The score acquiring unit 132 preferably accumulates the diversity score in the storage unit 11 in association with a date. The score acquiring unit 132 acquires, for example, the number of pieces of “response information indicating consumption in an amount greater than or equal to an intake
15 lower limit amount”, as the diversity score.

[0114] (Step S307) The risk acquiring unit 133 acquires risk information. An example of this risk information acquisition processing will be described with reference to the flowchart in FIG. 5.

[0115] (Step S308) The advice acquiring unit 134 acquires advice
20 information. An example of this advice information acquisition processing will be described with reference to the flowchart in FIG. 6.

[0116] (Step S309) The processing unit 13 configures information that is to be output, using one or two or more types of information out of the diversity score, the risk information, and the advice information.

25 [0117] (Step S310) The output unit 14 outputs the information configured in step S309. The procedure returns to step S301. The output unit 14 transmits, for example, the information configured in step S309 to the user terminal 2.

[0118] (Step S311) The instruction accepting unit 121 determines whether or
30 not it has accepted a statistical instruction. If it has accepted a statistical

instruction, the procedure advances to step S312, or otherwise the procedure returns to step S301. In this example, the accepting a statistical instruction is receiving the statistical instruction from the user terminal 2.

[0119] (Step S312) The statistical processing unit 135 acquires response
5 information corresponding to the statistical instruction. This response information is a set of response information for two or more days. This response information is, for example, a set of response information paired with the user identifier contained in the statistical instruction.

[0120] (Step S313) The statistical processing unit 135 performs statistical
10 processing on the response information acquired in step S312, thereby acquiring a statistical processing result. An example of this statistical processing will be described with reference to the flowchart in FIG. 7.

[0121] (Step S314) The score acquiring unit 132 acquires risk information
15 using the statistical processing result acquired in step S313. An example of this risk acquisition processing will be described with reference to the flowchart in FIG. 5.

[0122] (Step S315) The advice acquiring unit 134 acquires advice
information using the statistical processing result acquired in step S313. An example of this advice acquisition processing will be described with reference
20 to the flowchart in FIG. 6.

[0123] (Step S316) The processing unit 13 configures information that is to
be output, using one or two or more types of information out of the statistical processing result, the risk information, and the advice information.

[0124] (Step S317) The statistical output unit 145 outputs the information
25 configured in step S316. The procedure returns to step S301. In this example, the output is, for example, transmission to the user terminal 2.

[0125] In the flowchart in FIG. 3, the processing ends at power off or at an interruption of termination processing.

[0126] Next, an example of the screen information acquisition processing in
30 step S302 will be described with reference to the flowchart in FIG. 4.

[0127] (Step S401) The presentation information acquiring unit 131 acquires a set of lower limit information corresponding to the output instruction, from the lower limit storage unit 111.

5 [0128] (Step S402) The presentation information acquiring unit 131 acquires template information of response input screen information, from the storage unit 11.

[0129] (Step S403) The presentation information acquiring unit 131 substitutes 1 for a counter i .

10 [0130] (Step S404) The presentation information acquiring unit 131 determines whether or not there is an i^{th} food group identifier in the lower limit storage unit 111. If there is an i^{th} food group identifier, the procedure advances to step S405, or otherwise the procedure returns to the upper-level processing.

15 [0131] (Step S405) The presentation information acquiring unit 131 substitutes lower limit information paired with the i^{th} food group identifier for the position of a variable in the lower limit information paired with the i^{th} food group identifier of the template information.

[0132] (Step S406) The presentation information acquiring unit 131 increments the counter i by 1. The procedure returns to step S404.

20 [0133] Next, an example of the risk information acquisition processing in step S307 will be described with reference to the flowchart in FIG. 5.

[0134] (Step S501) The risk acquiring unit 133 substitutes 1 for a counter i .

[0135] (Step S502) The risk acquiring unit 133 determines whether or not there is an i^{th} risk condition in the risk storage unit 112. If there is an i^{th} risk condition, the procedure advances to step S503, or otherwise the procedure advances to step S508.

[0136] (Step S503) The risk acquiring unit 133 acquires the i^{th} risk condition from the risk storage unit 112.

30 [0137] (Step S504) The risk acquiring unit 133 acquires information on the user, the information being used in the i^{th} risk condition. The information

on the user is, for example, one or two or more types of information out of a diversity score, one or more attribute values, one or more pieces of response information, and a statistical processing result of the user.

[0138] (Step S505) The risk acquiring unit 133 determines whether or not
5 the information acquired in step S504 meets the i^{th} risk condition. If it meets the i^{th} risk condition, the procedure advances to step S506, or otherwise the procedure advances to step S507.

[0139] (Step S506) The risk acquiring unit 133 acquires risk information paired with the i^{th} risk condition, from the risk storage unit 112.

10 [0140] (Step S507) The risk acquiring unit 133 increments the counter i by 1. The procedure returns to step S502.

[0141] (Step S508) The risk acquiring unit 133 configures information that is to be output regarding a risk, using the risk information acquired in step S506. The procedure returns to the upper-level processing.

15 [0142] Next, an example of the advice information acquisition processing in step S308 will be described with reference to the flowchart in FIG. 6.

[0143] (Step S601) The advice acquiring unit 134 substitutes 1 for a counter i .

[0144] (Step S602) The advice acquiring unit 134 determines whether or not
20 there is an i^{th} advice condition in the advice storage unit 113. If there is an i^{th} advice condition, the procedure advances to step S603, or otherwise the procedure advances to step S608.

[0145] (Step S603) The advice acquiring unit 134 acquires the i^{th} advice condition from the advice storage unit 113.

25 [0146] (Step S604) The advice acquiring unit 134 acquires information on the user, the information being used in the i^{th} advice condition. The information on the user is, for example, one or two or more types of information out of a diversity score, one or more attribute values, one or more pieces of response information, and a statistical processing result of the user.

30 [0147] (Step S605) The advice acquiring unit 134 determines whether or not

the information acquired in step S604 meets the i^{th} advice condition. If it meets the i^{th} advice condition, the procedure advances to step S606, or otherwise the procedure advances to step S607.

5 [0148] (Step S606) The advice acquiring unit 134 acquires risk information paired with the i^{th} advice condition, from the advice storage unit 113.

[0149] (Step S607) The advice acquiring unit 134 increments the counter i by 1. The procedure returns to step S602.

[0150] (Step S608) The advice acquiring unit 134 configures information that is to be output regarding advice, using the advice information acquired in
10 step S606. The procedure returns to the upper-level processing.

[0151] Next, an example of the statistical processing result in step S313 will be described with reference to the flowchart in FIG. 7.

[0152] (Step S701) The score acquiring unit 132 substitutes 1 for a counter i .

[0153] (Step S702) The score acquiring unit 132 determines whether or not
15 there is an i^{th} set of response information. If there is an i^{th} set of response information, the procedure advances to step S703, or otherwise the procedure advances to step S705.

[0154] (Step S703) The score acquiring unit 132 acquires a diversity score using the i^{th} set of response information.

20 [0155] (Step S704) The score acquiring unit 132 increments the counter i by 1. The procedure returns to step S702.

[0156] (Step S705) The statistical processing unit 135 acquires a representative value of the diversity scores acquired in step S703.

[0157] (Step S706) The statistical processing unit 135 substitutes 1 for a
25 counter j .

[0158] (Step S707) The statistical processing unit 135 determines whether or not there is a j^{th} food group identifier. If there is a j^{th} food group identifier, the procedure advances to step S708, or otherwise the procedure advances to step S711.

30 [0159] (Step S708) The statistical processing unit 135 acquires two or more

pieces of response information paired with the j^{th} food group identifier. The two or more pieces of response information are response information respectively on different days.

[0160] (Step S709) The statistical processing unit 135 performs statistical
5 processing on the two or more pieces of response information acquired in step S708, thereby acquiring a statistical processing result. The statistical processing unit 135 acquires, for example, the number of “Yes” responses or the percentage of “Yes”. “Yes” is response information indicating that a food group has been consumed in an amount greater than or equal to an intake
10 lower limit amount.

[0161] (Step S710) The statistical processing unit 135 increments the counter i by 1. The procedure returns to step S707.

[0162] (Step S711) The statistical processing unit 135 configures information that is to be output, using the representative value acquired in step S705 and
15 the statistical processing result acquired in step S709. The procedure returns to the upper-level processing.

[0163] Hereinafter, a specific operation example of the inspection system A in this embodiment will be described.

[0164] It is assumed that the template information of the response input
20 screen information shown in FIG. 8 is stored in the storage unit 11 of the dietary diversity determining apparatus 1. This template information is information for configuring response input screen information. The template information indicates from <Table> </Table> that the response input screen information is information for configuring response input screen
25 in the form of a table. The template information indicates that the first line of the table contains the days of a week from “Mon” to “Sun”. Also, <loop variable = food group identifier> </loop> of the template information indicates that the information in the loop tag is repeated as many times as the number of food group identifiers (in this case, “10”) to configure records in
30 the table. The information in the tag within the loop tag also indicates that

each record in the table has text lower limit information, image lower limit information, a food group identifier, and seven fields. The text lower limit information is lower limit information using text. The image lower limit information is lower limit information using an image. Also, <field value =
5 Yes or No (empty)> indicates that “Yes” or “No (which may be empty)” is input to a field.

[0165] Furthermore, the lower limit information management table shown in FIG. 9 is stored in the lower limit storage unit 111. The lower limit information management table is a table having lower limit information.

10 Two or more records each having lower limit information for each user condition and for each food group identifier are stored in the lower limit information management table. In this example, there are “10” food group identifiers and thus the lower limit information management table has ten records. The lower limit information management table has two user
15 conditions “user condition 1” and “user condition 2”. It is assumed that “user condition 1” is, for example, “<race>Japanese & <overall food intake>normal”. Alternatively, it is assumed that “user condition 1” is, for example, “<race>Japanese & <overall food intake>eats a lot”. “User condition 1” has only “text lower limit information”, and “user condition 2”
20 has “text lower limit information” and “image lower limit information”. In the lower limit information management table, lower limit information corresponding to user condition 3, user condition 4, and other conditions may be managed.

[0166] Furthermore, it is assumed that the risk information management
25 table shown in FIG. 10 is stored in the risk storage unit 112. One or more records each having “ID”, “risk information”, and “risk condition” are managed in the risk information management table. “ID” is information for identifying a record. “Risk information” has “risk identifier” and “degree information”. “Risk identifier” is information for identifying a risk. “Risk
30 identifier” in this example is a name of a risk. “Degree information” is

information indicating the degree of a risk. In this example, “degree information” is a value with respect to the normal risk degree of “1”. The degree information “0.68” indicates that the risk is reduced by a factor of “0.68”. “Degree information” may be information for specifying an increase
5 in a risk. “Risk condition” is a condition corresponding to “risk information”. “Risk condition” in this example is a condition using one or two or more types out of a diversity score, a statistical processing result of a diversity score (e.g., a representative value (e.g., a mean value, a median value, a lowest value, a largest value) in a predetermined period (e.g., one week), and one or two or
10 more pieces of response information. In FIG. 10, “risk condition” is a condition using only a diversity score, but may be a condition using a score of one or two or more specific food groups, or a condition using a diversity score and a score of one or more specific food groups.

[0167] Moreover, it is assumed that the advice information management
15 table shown in FIG. 11 is stored in the advice storage unit 113. One or more records each having “ID”, “advice condition”, and “advice information” are managed in the advice information management table. “ID” is information for identifying a record. “Advice condition” is a condition corresponding to “advice information”. “Advice condition” in this example is a condition using
20 one or two or more types out of a diversity score, a statistical processing result of a diversity score, and one or two or more pieces of response information.

[0168] In this situation, it is assumed that the user inputs an output instruction containing “<race>Japanese & <overall food intake>eats a lot”
25 and further containing the user identifier “U001”, to the user terminal 2. The user terminal 2 accepts this output instruction and transmits the output instruction to the dietary diversity determining apparatus 1.

[0169] Next, the instruction accepting unit 121 of the dietary diversity
determining apparatus 1 receives the output instruction “<user
30 identifier>U001 <race>Japanese <overall food intake>eats a lot”.

[0170] Next, the presentation information acquiring unit 131 determines that “<race>Japanese <overall food intake>eats a lot” contained in the output instruction is met by “user condition 2” contained in the lower limit information management table in FIG. 9. The presentation information
5 acquiring unit 131 acquires the text lower limit information and the image lower limit information of “user condition 2” contained in the lower limit information management table in FIG. 9, each in association with a food group identifier.

[0171] Next, the presentation information acquiring unit 131 acquires
10 template information of response input screen information (FIG. 8) from the storage unit 11.

[0172] Next, the presentation information acquiring unit 131 substitutes the acquired text lower limit information, image lower limit information, and food group identifier of each of the 10 food group identifiers, for the positions of
15 variables (tags) in the template information (FIG. 8), thereby configuring response input screen information for the user to input response information.

[0173] Next, the presentation information output unit 141 transmits the acquired response input screen information to the user terminal 2 from which the output instruction was transmitted.

20 [0174] Next, the user terminal 2 receives the response input screen information, and configures a response input screen using the response input screen information. The user terminal 2 displays the response input screen. FIG. 12 shows an example of such a response input screen. In FIG. 12, the intake lower limit amount required for each food group is indicated by text
25 and an image. In the response input screen, the intake lower limit amount required for each food group does not need to be placed next to the food group identifier, as long as the user can know the lower limit amount of each food group that is recommended to be consumed per day.

[0175] It is assumed that the user inputs “Yes” to the fields for Monday
30 corresponding to the food groups consumed in an amount greater than or

equal to the indicated lower limit amount, using the user terminal 2, after three meals today (Monday). It is assumed that the user instructs an unshown “transmit” button of the user terminal 2. Next, the user terminal 2 acquires response information indicating “Yes” or “empty” in association with each of the 10 food group identifiers. It is assumed that the set of response information is “<grains>Yes <potatoes> <green and yellow vegetables>Yes <other vegetables>Yes <fruits>Yes <meats>Yes <seafoods>Yes <eggs>Yes <beans>Yes <dairy products>Yes”. Next, the user terminal 2 transmits this set of response information to the dietary diversity determining apparatus 1 in a pair with “<user identifier>U001”.

[0176] Next, in response to output of the response input screen information, the response accepting unit 122 of the dietary diversity determining apparatus 1 receives “<user identifier>U001 <grains>Yes <potatoes> <green and yellow vegetables>Yes <other vegetables>Yes <fruits>Yes <meats>Yes <seafoods>Yes <eggs>Yes <beans>Yes <dairy products>Yes” from the user terminal 2.

[0177] Next, the response accepting unit 122 accumulates the ten pieces of response information, in the storage unit 11, in association with the user identifier and the respective food group identifiers. The response accepting unit 122 preferably accumulates “1” corresponding to “Yes”.

[0178] Next, the score acquiring unit 132 calculates the number of “Yes” responses (adds “1”), thereby obtaining a diversity score “9”. It is assumed that the score acquiring unit 132 acquires the date “May 29” from an unshown clock. The score acquiring unit 132 accumulates the diversity score “9” in the storage unit 11 in association with the date “May 29” and the response information.

[0179] Next, the risk acquiring unit 133 acquires risk information as follows. That is to say, the risk acquiring unit 133 refers to the risk management table in FIG. 10, and acquires risk information “<risk identifier>cognitive decline <degree information>0.56”, “<risk identifier>hippocampal atrophy

<degree information>0.50", and "<risk identifier>cardiovascular system
 diseases <degree information>0.75" paired with a risk condition that is met
 by the diversity score "9". Since the response information corresponding to
 "<user identifier>U001" " does not exist for seven days or more, which is the
 5 period for statistical processing in this example, and thus there is no
 statistical processing result.

[0180] Next, the advice acquiring unit 134 acquires advice information as
 follows. That is to say, the advice acquiring unit 134 refers to the advice
 management table in FIG. 11, and acquires advice information "Keep it up!
 10 It would be better if you consume <food group identifier with \$ value of 0>.
 ..." of "ID = 3" paired with an advice condition that is met by the diversity
 score "9". The advice acquiring unit 134 substitutes the food group identifier
 "potatoes" paired with the response information that is empty, for the
 variable <food group identifier with \$ value of 0>, thereby configuring "Keep
 15 it up! It would be better if you consume potatoes. ...".

[0181] Next, the processing unit 13 configures information that is to be
 output, using the acquired diversity score "9", risk information, and advice
 information. There is no limitation on the method for configuring
 information that is to be output. Next, the output unit 14 transmits the
 20 configured information to the user terminal 2.

[0182] Next, the user terminal 2 receives and outputs the information.
 FIG. 13 shows an output example of such information. In FIG. 13, a
 diversity score, risk information, and advice information for today's responses
 are output.

25 [0183] Furthermore, it is assumed that the user identified with "<user
 identifier>U001" inputs, for each food group identifier, response information
 as to whether or not consumption has been made in an amount greater than
 or equal to the indicated lower limit amount for each day of a week as shown
 in FIG. 14, and a set of response information (ten pieces of response
 30 information) for each of the seven days is accumulated in the storage unit 11

in association with “<user identifier>U001”. The user preferably inputs response information for each day after dinner on each day.

[0184] Next, the processing unit 13 of the dietary diversity determining apparatus 1 detects that response information for one week, for which

5 appropriate statistical processing can be performed, has been accumulated, and determines to perform statistical processing on the response information on the user identified with “<user identifier>U001”.

[0185] Next, the score acquiring unit 132 calculates a diversity score for each day of a week through processing as described above. Next, it is assumed

10 that the statistical processing unit 135 acquires a mean value “7.7” of the seven acquired diversity scores.

[0186] Next, the statistical processing unit 135 acquires a score (the number of “Yes” responses) of each food group identifier, using the seven pieces of response information respectively paired with the food group identifiers, and

15 accumulates the score in association with the food group identifier and “<user identifier>U001”. In this example, it is assumed that the statistical processing unit 135 accumulates “<user identifier>U001 <grains>7 <potatoes>1 <green and yellow vegetables>7 <other vegetables>6 <fruits>6 <meats>6 <seafoods>4 <eggs>5 <beans>5 <dairy products>7”.

[0187] Next, the risk acquiring unit 133 acquires risk information as follows.

That is to say, the risk acquiring unit 133 refers to the risk management table in FIG. 10, and detects a risk condition that is met by the mean value “8.3” of the diversity scores and the total value (score) of the response

25 information for each food group identifier for seven days “<grains>7 <potatoes>1 <green and yellow vegetables>7 <other vegetables>6 <fruits>6 <meats>6 <seafoods>4 <eggs>5 <beans>5 <dairy products>7”.

In this example, the risk acquiring unit 133 determines that a risk condition with the degree information “0.82” of “ID = 2” is met. The risk

30 acquiring unit 133 acquires “<risk identifier>hippocampal atrophy <degree

information>0.82". The risk acquiring unit 133 determines that a risk condition with the degree information "0.75" of "ID = 3" is met. The risk acquiring unit 133 acquires "<risk identifier>cardiovascular system diseases <degree information>0.75". The risk acquiring unit 133 determines that a risk condition with the degree information "0.45" of "ID = 5" is met. The risk acquiring unit 133 acquires "<risk identifier>frailty <degree information>0.45".

[0188] Furthermore, the advice acquiring unit 134 acquires advice information as follows. That is to say, the advice acquiring unit 134 refers to the advice management table in FIG. 11, and detects an advice condition that is met by the mean value of the diversity scores and the total value (score) of the response information for each food group identifier for seven days. In this example, the advice acquiring unit 134 determines that an advice condition of "ID = 2" is met. The advice acquiring unit 134 acquires advice information "The intake of <\$ specific food group identifier> is too low. ...". The advice acquiring unit 134 acquires food group identifiers "potatoes" and "seafoods" that meet "score <= 4" corresponding to <\$ specific food group identifier>. Next, the advice acquiring unit 134 substitutes the food group identifiers "potatoes" and "seafoods" for the variable <\$ specific food group identifier>, thereby configuring advice information "The intake of "potatoes" and "seafoods" is too low. ...".

[0189] Next, the processing unit 13 configures information that is to be output, using the statistical processing result, the risk information, and the advice information. The statistical output unit 145 transmits the configured information to the user terminal 2 identified with "<user identifier>U001".

[0190] Next, the user terminal 2 receives and outputs the information.

FIG. 15 shows an output example of such statistical processing result and the like.

[0191] As described above, according to this embodiment, input of response information for specifying whether or not consumption has been made in an

amount greater than or equal to an appropriate intake lower limit amount is accepted for each food group, and a diversity score is acquired using the response information for the food group, and thus it is possible to accurately and easily acquire the degree of dietary diversity. In the case of using
5 response information for simply specifying whether or not each of two or more food groups has been consumed, consumption even in a very small amount will be treated as if it were appropriate consumption, and thus it is not possible to acquire an accurate diversity score. On the other hand, if the user knows an appropriate intake lower limit amount and uses the input
10 response information, it is possible to easily acquire an accurate diversity score for dietary diversity.

[0192] Furthermore, according to this embodiment, lower limit information that meets user conditions based on user attribute values is used, and thus it is possible to easily acquire an accurate diversity score that matches each
15 user.

[0193] Furthermore, according to this embodiment, it is possible to notify a user of a risk corresponding to a diversity score. According to this embodiment, it is possible to notify a user of a risk corresponding to a diversity score and a degree to which the risk is likely to occur.

20 [0194] Furthermore, according to this embodiment, it is possible to provide a user with appropriate advice corresponding to a diversity score.

[0195] Moreover, according to this embodiment, a user is notified of a result of performing statistical processing on response information for two or more days, and thus it is possible to make a contribution to the user's health.

25 [0196] According to this embodiment, for example, the user inputs response information on the response input screen displayed on the user terminal 2. However, the user may input response information to a sheet made of paper. Such a sheet is a sheet including two or more pieces of presentation information each in a manner in which a food group identifier for identifying
30 a food group is associated with lower limit information for the food group, and

a field that accepts input of response information for each of the two or more pieces of presentation information. The field in this example is an area on the sheet.

[0197] Furthermore, there is an index “QUANTIDD” as an index for dietary diversity. “QUANTIDD” is an index calculated using Formula 1 below.

[0198]

Formula 1

$$\text{QUANTIDD} = \frac{1 - \sum_{j=1}^n \text{prop}(j)^2}{1 - \frac{1}{n}}$$

[0199] In Formula 1, prop (j) is the proportion of energy and various nutrients consumed from a food group “j”. Also, n is the total number of food groups consumed. The range of possible values for j is a natural number from 1 to n. The food groups that are used to calculate “QUANTIDD” are, for example, 10 food groups “grains, potatoes, beans, green and yellow vegetables, other vegetables (including mushrooms and seaweeds), fruits, eggs, seafoods, meats, dairy products” or 17 food groups “grains, potatoes, beans, seeds, green and yellow vegetables, other vegetables, mushrooms, seaweeds, fruits, eggs, seafoods, meats, dairy products, sugar and sweeteners, confectioneries, fats and oils, seasonings”. It is said that, if the value of “QUANTIDD” is 0.9 or more, a good dietary diversity is maintained.

[0200] The processing in this embodiment may be realized by software. The software may be distributed by software downloads or the like.

Furthermore, the software may be distributed in a form where the software is stored in a recording medium such as a CD-ROM. The same applies to other embodiments in this specification. The software that realizes the dietary diversity determining apparatus 1 in this embodiment is the following sort of program. Specifically, this program is a program for causing a computer

capable of accessing a lower limit storage unit in which lower limit information for specifying an appropriate intake lower limit amount for each of two or more food groups is stored, to function as: a presentation information output unit that outputs two or more pieces of presentation information each in a manner in which lower limit information is associated with a food group identifier for identifying a food group corresponding to the lower limit information; a response accepting unit that accepts response information for specifying whether or not food groups respectively corresponding to the two or more pieces of presentation information have been consumed in amounts greater than or equal to those specified by lower limit information respectively corresponding to the two or more pieces of presentation information; a score acquiring unit that acquires a diversity score, which is a score regarding dietary diversity, using the response information accepted by the response accepting unit; and a score output unit that outputs the diversity score acquired by the score acquiring unit.

[0201] FIG. 16 shows the external appearance of a computer that executes the program described in this specification to realize the dietary diversity determining apparatus 1 and the like in various embodiments described above. The foregoing embodiments may be realized using computer hardware and a computer program executed thereon. FIG. 16 is a schematic view of a computer system 300. FIG. 17 is a block diagram of the system 300.

[0202] In FIG. 16, the computer system 300 includes a computer 301 including a CD-ROM drive, a keyboard 302, a mouse 303, and a monitor 304.

[0203] In FIG. 17, the computer 301 includes, in addition to the CD-ROM drive 3012, an MPU 3013, a bus 3014 connected to the CD-ROM drive 3012 and the like, a ROM 3015 in which a program such as a boot up program is stored, a RAM 3016 that is connected to the MPU 3013 and is a memory in which a command of an application program is temporarily stored and a temporary storage area is provided, and a hard disk 3017 in which an

application program, a system program, and data are stored. Although not shown, the computer 301 may further include a network card that provides connection to a LAN.

[0204] The program for causing the computer system 300 to execute the

5 functions of the dietary diversity determining apparatus 1 and the like in the foregoing embodiments may be stored in a CD-ROM 3101 that is inserted into the CD-ROM drive 3012, and be transmitted to the hard disk 3017. Alternatively, the program may be transmitted via a network (not shown) to the computer 301 and stored in the hard disk 3017. At the time of execution,
10 the program is loaded into the RAM 3016. The program may be loaded from the CD-ROM 3101. Alternatively, the program may be loaded directly from a network.

[0205] The program does not necessarily have to include, for example, an operating system (OS) or a third party program to cause the computer 301 to

15 execute the functions of the dietary diversity determining apparatus 1 and the like in the foregoing embodiments. The program may only include a command portion to call an appropriate function (module) in a controlled mode and obtain desired results. The manner in which the computer system 300 operates is well known, and thus a detailed description thereof has been
20 omitted.

[0206] It should be noted that, in the program, in a step of transmitting information, a step of receiving information, or the like, processing that is performed only by hardware, for example, processing performed by a modem or an interface card in the transmitting step (processing that can be
25 performed only by hardware) is not included.

[0207] Furthermore, the computer that executes the program may constituted by a single computer, or constituted by multiple computers. That is to say, centralized processing may be performed, or distributed processing may be performed.

30 [0208] Furthermore, in the foregoing embodiments, it will be appreciated

that two or more communication parts in one apparatus may be physically realized by one medium.

[0209] In the foregoing embodiments, each process may be realized as centralized processing using a single apparatus, or may be realized as distributed processing using multiple apparatuses.

Experiment

[0210] The following is a description of an experiment regarding the dietary diversity determining apparatus 1.

A. Background and Purpose of the Experiment

[0211] Dietary diversity has been reported to be positively associated with health maintenance (see “Otsuka R, et al.: Dietary diversity and 14-year decline in higher-level functional capacity among middle-aged and elderly Japanese. *Nutrition*, 32: 784-9, 2016”, “Yokoyama Y, et al.: Dietary variety and decline in lean mass and physical performance in community-Dwelling older Japanese: A 4-year Follow-Up Study. *J. Nutr.Health Aging*, 21: 11-16, 2017”). Dietary diversity is calculated, for example, as a diversity index such as Quantitative Index for Dietary Diversity (QUANTIDD), but

calculating and using the index in real life is complicated and impractical.

Although there are examples of the use of a simple checklist to check dietary diversity in daily life (see “Hata T, et al.: The effects of the “Tabepo Check Sheet,” which lists 10 food groups, on the dietary variety of older adults in a metropolitan area. *Nihon Kosshu Eisei Zasshi*, 68: 477-92, 2021”), the existing simple checklists do not set a lower limit value of intake for each food group, and are configured such that consumption of a food group even in a very small amount will be treated as if it were consumption of that food group.

Therefore, it is difficult to determine accurate dietary diversity considering lower intake limit values. The development of a simple self-administered

checklist for dietary diversity that takes into account the lower intake limit

values is expected to contribute to the realization of dietary diversity in real life and to the improvement of health. The purpose of this application is to provide a simple self-administered checklist (sheet) for dietary diversity that takes into account the lower intake limit values, and to provide a dietary diversity determining apparatus 1 that uses the simple self-administered checklist. In this experiment, in order to set the lower intake limit value for each food group, the association between QUANTIDD calculated from the dietary survey data and the number of food groups tallied from the same data is examined.

B. Experimental Method

(1) Subjects of the experiment

[0212] Dietary and other surveys were conducted on healthy Japanese men and women (208 subjects) aged 55 to 79 years.

(2) Analysis items

[0213] Age, sex, Body Mass Index (BMI), and the Brief-Type Self-Administered Diet History Questionnaire (BDHQ) were taken as the analysis items.

(3) Calculation of Quantitative Index for Dietary Diversity (QUANTIDD)

[0214] QUANTIDD for 10 food groups (grains, potatoes, green and yellow vegetables, other vegetables (including seaweeds and mushrooms), fruits, meats, seafoods, eggs, beans, and dairy products), 12 food groups (grains, potatoes, green and yellow vegetables, other vegetables (not including seaweeds and mushrooms), seaweeds, mushrooms, fruits, meats, seafoods, eggs, beans, and dairy products), 15 food groups (grains, potatoes, green and yellow vegetables, other vegetables (not including seaweeds and mushrooms), seaweeds, mushrooms, fruits, meats, seafoods, eggs, beans, dairy products, sugar and sweeteners, fats and oils, and confectioneries) of the subjects were

calculated according to Formula 1 above using the BDHQ data.

(4) Number of food groups considered to have been consumed

[0215] A lower limit value for each food group considered to have been

5 consumed was arbitrarily set, and the number of food groups consumed per day was tallied from the BDHQ data.

(5) Correlation analysis between QUANTIDD and the number of food groups consumed (including settings of a lower limit value for each food group to be
10 considered to have been consumed)

[0216] Correlation analysis was performed between QUANTIDD calculated above and the number of food groups. The lower limit value of intake (g/day) for a food group to be considered to have been “consumed” was examined in an exploratory manner when tallying the number of food groups consumed,
15 aiming to find a lower intake limit value for each food group that would provide an analysis result in which a good correlation between QUANTIDD and the number of food groups is obtained and 0.1 of QUANTIDD with a value between 0 and 1 corresponds to approximately 1 of the number of food groups consumed with a value between 0 and 10-15.

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(6) Statistical analysis

[0217] Numeric values are presented as mean $\pm$ standard deviation.

Pearson’s correlation analysis was performed for correlation analysis. The correlation coefficient (r) was considered as “0 to less than 0.3: almost no
25 relationship”, “0.3 to less than 0.5: very weak correlation”, “0.5 to less than 0.7: correlation”, “0.7 to less than 0.9: strong correlation”, and “0.9 or more: very strong”. The significance level was $p < 0.05$.

C. Experimental results

30 (1) Subject background

[0218] FIG. 18 shows the backgrounds of the subjects. QUANTIDD were 0.884 ± 0.086 (smallest 0.496 to largest 0.982), 0.874 ± 0.087 (smallest 0.488 to largest 0.972) and 0.877 ± 0.078 (smallest 0.519 to largest 0.967) for the 10, 12, and 15 food groups respectively.

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(2) QUANTIDD associations calculated from 10, 12, and 15 food groups

[0219] FIG. 19(a) shows the correlation between QUANTIDD calculated from the 10 food groups and values calculated from the 12 food groups. FIG. 19(b) shows the correlation between QUANTIDD calculated from the 10 food groups and values calculated from the 15 food groups. It was found that $r = 0.998$ ($p < 0.001$) for the 10 vs. 12 food groups and $r = 0.990$ ($p < 0.001$) for the 10 vs. 15 food groups, both showing a very strong positive correlation.

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[0220] FIG. 20 shows the conversion of QUANTIDD calculated from the 10 food groups (range of 0.5-1) and values calculated from the 12 and 15 food groups using the respective regression equations. FIG. 20(a) shows a conversion table of QUANTIDD from the 10 food groups to the 12 food groups. FIG. 20(b) shows a conversion table of QUANTIDD from the 10 food groups to the 15 food groups. FIG. 20(c) shows a conversion table of QUANTIDD from the 12 food groups to the 10 food groups. FIG. 20(d) shows a conversion table of QUANTIDD from the 15 food groups to the 10 food groups. As shown in FIG. 20, the QUANTIDD scores calculated from the 10 food groups and the 12 and 15 food groups showed extremely high agreement for QUANTIDD (0.5-1) within the range of values that can realistically be taken. It is seen from these results that the number of food groups that are used by the dietary diversity determining apparatus 1 to acquire a diversity score (in this example, QUANTIDD) is preferably 10. This is because it is better to reduce the user burden. However, as shown in FIG. 20, the number of food groups that are used by the dietary diversity determining apparatus 1 may be 11 or more, such as 12 or 15 food groups.

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[0221] From those described above, the analysis in this experiment

regarding the settings of a lower limit value for each food group to be considered to have been “consumed” was conducted on the basis of 10 food groups.

- 5 (3) Association between QUANTIDD calculated from 10 food groups and the number of food groups considered to have been “consumed” using each lower limit value

[0222] A lower limit value of intake of daily intake for each food group that would provide a relationship in which 0.1 of QUANTIDD (0 to 1) corresponds
10 to approximately 1 of the number of food groups consumed (0 to 10).

[0223] In the case in which a food group is considered to have been “consumed” without setting a lower limit value (consumption even in an amount of 1 g per day is considered as consumption of that food group), the correlation between QUANTIDD and the number of food groups consumed is
15 a very weak positive correlation ($r = 0.249$ ($p < 0.001$)), and the conversion using the regression equation also shows that the number of food groups consumed was 9.37 to 9.97 with QUANTIDD ranging from 0.5 to 1 (see FIG. 21(a) and 2201 of FIG. 22). In FIG. 21(a), the horizontal axis indicates QUANTIDD, and the vertical axis indicates the number of food groups
20 consumed in the case in which consumption even in an amount of 1 g per day is considered as consumption of that food group. FIG. 22 is a graph for different conditions under which a food group is considered to have been consumed, where the horizontal axis indicates QUANTIDD, and the vertical axis indicates food groups consumed.

25 [0224] FIG. 22 is a graph showing a comparison between QUANTIDD calculated from the 10 food groups, the number of food groups considered to have been consumed (for each lower limit value, $n = 208$), and target values. FIG. 23 is a table from which FIG. 22 is obtained, showing the correspondence between QUANTIDD, the number of food groups considered
30 to have been consumed (for each lower limit value, $n = 208$), and target

values. In FIG. 22, 2203 is a graph of the target (a graph showing the relationship between the number of food groups consumed and QUANTIDD).

[0225] Next, in the case in which a food group is considered to have been “consumed” if that food group is consumed in a minimum amount (10 g or

5 more) that could be recognized as consumption, the correlation between QUANTIDD and the number of food groups consumed is a weak positive correlation ($r = 0.479$ ($p < 0.001$)), and the conversion using the regression equation also shows the number of food groups consumed was 7.83 to 9.99 with QUANTIDD ranging from 0.5 to 1 (see FIG. 21(b) and 2202 of FIG. 22).

10 In FIG. 21(b), the horizontal axis indicates QUANTIDD, and the vertical axis indicates the number of food groups consumed in the case in which consumption in an amount of 10 g or more per day is considered as consumption of that food group.

[0226] Based on the results described above, the optimum lower limit value
15 for each food group was searched for, and the optimum condition was found to be that food groups are considered to have been “consumed” with a lower limit value of 5% or more for four food groups (green and yellow vegetables, other vegetables, fruits, and dairy products) and a lower limit value of 1.5% or more for the other six food groups (grains, potatoes, beans, meats,
20 seafoods, and eggs) with respect to the total weight (g/day) of the 10 food groups consumed (see FIG. 21(c) and 2204 of FIG. 22).

[0227] In this condition, the correlation between QUANTIDD and the number of food groups consumed is a strong positive correlation ($r = 0.713$ ($p < 0.001$)), and the conversion using the regression equation also shows the
25 number of food groups consumed was 4.85 to 9.70 with QUANTIDD ranging from 0.5 to 1 (see FIG. 21 and 2204 of FIG. 22). In FIG. 21(c), the horizontal axis indicates QUANTIDD, and the vertical axis indicates the number of food groups consumed in the case in which consumption in an amount of 5% or more or 1.5% or more per day is considered as consumption of that food
30 group.

[0228] Note that 2203 and 2204 of FIG. 22 show a comparison between the condition “ $\geq 5\%/1.5\%$ ” found as described above and the target values. It was seen that a relationship is obtained in which 0.1 of QUANTIDD (0 to 1) corresponds to approximately 1 of the number of food groups consumed (0 to 5 10).

[0229] Furthermore, “5% or more for four food groups (green and yellow vegetables, other vegetables, fruits, and dairy products) with respect to the total weight (g/day) of the 10 food groups consumed” can be said to be “5% or more of the median value of any quartile of the total weight of the 10 food groups consumed”.

[0230] Furthermore, “1.5% or more for the other six food groups (grains, potatoes, beans, meats, seafoods, and eggs) with respect to the total weight (g/day) of the 10 food groups consumed” can be said to mean “1.5% or more of the median value of any quartile of the total weight of the 10 food groups consumed”.

[0231] Furthermore, in the case of the top quartile of the total intake, 5% of the median value for the four food groups (green and yellow vegetables, other vegetables, fruits, and dairy products) is roughly 75 g. Also, 1.5% of the median value for the six food groups is roughly 23 g.

[0232] Moreover, in the case of the bottom quartile of the total intake, 5% of the median value for the four food groups (green and yellow vegetables, other vegetables, fruits, and dairy products) is roughly 36 g. Also, 1.5% of the median value for the six food groups is roughly 11 g.

[0233] From those described above, in the case in which the optimum lower limit value for each food group is expressed in terms of weight, the lower limit value may be, for example, roughly 75 g for the above-mentioned four food groups and roughly 23 g for the above-mentioned six food groups. The optimum lower limit value for each food group may be, for example, roughly 36 g for the above-mentioned four food groups and roughly 11 g for the above-mentioned six food groups.

D. Discussion

(1) Validity of QUANTIDD scores in this experiment

[0234] The QUANTIDD scores calculated by the BDHQ in this experiment
5 are considered to be reasonable in comparison with existing reports. In this
experiment, QUANTIDD was calculated using the BDHQ in healthy
Japanese subjects aged 55-79 years, and the mean values (smallest-largest)
for the 10, 12, and 15 food groups were 0.884 (0.496-0.982), 0.874 (0.488-
0.972), and 0.877 (0.519-0.967), respectively. Several QUANTIDD scores
10 have been reported for Japanese subjects. The mean value (smallest-
largest) of QUANTIDD for 16 food groups using the results of the Japanese
National Nutrition Survey (1996) was 0.87 (0.0-0.97) (see “Katanoda K, et al.:
New Quantitative Index for Dietary Diversity (QUANTIDD) and its annual
changes in the Japanese. *Nutrition*, 22: 283-7, 2006”). Otsuka and others
15 conducted a 3-day study on men and women (n = 570) aged 60 to 81 years
living in the community, and reported QUANTIDD for 17 food groups (grains,
potatoes, seeds, green and yellow vegetables, other vegetables, seaweeds,
mushrooms, fruits, meats, seafoods, eggs, beans, dairy products, sugar and
sweeteners, fats and oils, confectioneries, and seasonings), where the median
20 value (smallest-largest) thereof was 0.898 (0.691-0.953) (see “Otsuka R, et al.:
Dietary diversity decreases the risk of cognitive decline among Japanese
older adults. *Geriatr Gerontol Int*, 17: 937-44, 2017”). Nakamoto and others
conducted a dietary survey according to Food Frequency Questionnaire (FFQ)
on men and women (n = 1312) aged 20 to 63 years living in the community,
25 and reported QUANTIDD for 16 food groups (grains, potatoes, seeds, green
and yellow vegetables, other vegetables, seaweeds, mushrooms, fruits, meats,
seafoods, eggs, beans, dairy products, sugar and sweeteners, fats and oils,
and confectioneries), where the median value (smallest-largest) thereof was
0.83 (0.00-1.00) for men and 0.88 (0.00-1.00) for women (see “Nakamoto M, et
30 al.: Dietary diversity and characteristics of lifestyle and awareness of health

in Japanese workers: a cross-sectional study. J Med Invest, 67: 255-64, 2020"). From those described above, although the dietary survey method, the number of food groups used to calculate QUANTIDD, and the characteristics of the experimental subjects were different, the QUANTIDD scores in this experiment and those reported in existing studies were similar in range, and thus the QUANTIDD scores in this experiment are considered reasonable.

(2) Influence of difference in the number of food groups used in calculation on QUANTIDD scores

[0235] Although the number of food groups that are used to calculate QUANTIDD can be freely chosen, many reports indicate that it is calculated with about 16 food groups. On the other hand, there is no knowledge of the influence of difference in the number of food groups used in calculation of QUANTIDD on the QUANTIDD scores. In this experiment, QUANTIDD scores for 10, 12, and 15 food groups were calculated and their relationships were examined. The QUANTIDD scores of the 10, 12, and 15 food groups showed very strong positive correlations ($r \geq 0.990$), and also showed extremely high agreement for QUANTIDD (0.5-1) within the range of values that can realistically be taken. This suggests that QUANTIDD calculated from at least 10 food groups (grains, potatoes, green and yellow vegetables, other vegetables, fruits, meats, seafoods, eggs, beans, and dairy products) will converge within a certain range. It seems from those described above that, if the number of food groups that are used in the calculation is 10 or more, the influence on the QUANTIDD scores is small.

(3) Regarding QUANTIDD scores and lower limit value of intake for each food group to be considered to have been "consumed"

[0236] Although there are examples of the use of a simple checklist to check dietary diversity (see "Hata T, et al.: The effects of the "Tabepo Check Sheet,"

which lists 10 food groups, on the dietary variety of older adults in a metropolitan area. Nihon Kosho Eisei Zasshi, 68: 477-92, 2021”), the existing simple checklists do not set a lower limit value of intake for each food group, and are configured such that consumption of a food group even in a very small amount will be treated as if it were consumption of that food group. Therefore, it is difficult to determine accurate dietary diversity considering lower intake limit values. In fact, in this experiment as well, if a lower limit value of daily intake for a food group to be considered to have been “consumed” was not set (lower limit value > 0 g), the QUANTIDD scores and the number of food groups considered to have been “consumed” had a very weak positive correlation, and it was considered difficult to estimate QUANTIDD from the number of food groups “consumed”. On the other hand, it was seen that, if a lower limit value for each food group to be considered to have been “consumed” was arbitrarily set (lower limit value >= 10 g), the correlation coefficient between them increased. Based on these results, it seems that a lower limit value of intake for a food group to be considered to have been “consumed” needs to be set in order to increase the correlation between the QUANTIDD scores and the number of food groups consumed.

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(4) Setting of lower limit value of intake for each food group to be considered to have been “consumed” for estimation of QUANTIDD scores
[0237] In order to develop a self-administered checklist that enables easy and accurate confirmation of QUANTIDD from the number of food groups consumed, in the dietary diversity determining apparatus 1, attempts were made to find a lower intake limit value for each food group that would provide an analysis result in which a good correlation between QUANTIDD and the number of food groups consumed is obtained and 0.1 of QUANTIDD with a value between 0 and 1 corresponds to approximately 1 of the number of food groups consumed with a value between 0 and 10-15. The study of

combinations of lower limit values for food groups showed a strong positive correlation between QUANTIDD and the number of food groups consumed, and further showed a match with a target condition (an analysis result in which 0.1 of QUANTIDD with a value between 0 and 1 corresponds to

5 approximately 1 of the number of food groups consumed with a value between 0 and 10), in the case in which 5% (four food groups: green and yellow vegetables, other vegetables, fruits, and dairy products) and 1.5% (the other six food groups) were taken as the lower limit values as to whether or not consumption has been made. This suggests that the use of this condition
10 enables an accurate determination of dietary diversity (QUANTIDD) from the number of food groups consumed.

[0238] Note that 5% (four food groups: green and yellow vegetables, other vegetables, fruits, and dairy products) of the total weight of the 10 food groups consumed is roughly 75 g in the case in which the total intake of the
15 representative 10 food groups is consumed. That is to say, for example, the lower limit value for the four food groups is preferably $75 \text{ g} \pm 10 \text{ g}$ and more preferably 75 g. Also, 1.5% (the other six food groups) of the total weight of the 10 food groups consumed is roughly 23 g in the case in which the total intake of the representative 10 food groups is consumed. That is to say, for
20 example, the lower limit value for the six food groups is preferably $23 \text{ g} \pm 10 \text{ g}$ and more preferably 23 g. The total intake of the representative 10 food groups is, for example, the median value of the top quartile of the total intake of the 10 food groups by all subjects. There is no limitation on the method for determining the total intake of the representative 10 food groups.

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E. Conclusion

[0239] Using BDHQ data for Japanese men and women, the association between QUANTIDD serving as a dietary diversity score and the number of food groups consumed was evaluated, and a lower intake limit value for each
30 food group was found that would provide an analysis result in which a strong

positive correlation between QUANTIDD and the number of food groups consumed is obtained and 0.1 of QUANTIDD corresponds to approximately 1 of the number of food groups consumed. Based on this knowledge, a checklist (10 food groups or 11 or more food groups) that can easily and accurately evaluate dietary diversity (QUANTIDD) has been developed. Also, a dietary diversity determining apparatus 1 using the checklist (e.g., 10 food group) has been developed.

[0240] It is expected that the use of the dietary diversity determining apparatus 1 by users will contribute to the realization of dietary diversity in real life and to the improvement of health.

[0241] The present invention is not limited to the embodiment set forth herein. Various modifications are possible within the scope of the present invention.

15 Industrial Applicability

[0242] As described above, the dietary diversity determining apparatus 1 according to the present invention has the effect of making it possible to accurately and easily acquire the degree of dietary diversity, thus rendering this apparatus useful as a server that determines dietary diversity and the like.

CLAIMS

1. A dietary diversity determining apparatus comprising:
 - a lower limit storage unit in which lower limit information for
 - 5 specifying an appropriate intake lower limit amount for each of two or more food groups is stored;
 - a presentation information output unit that outputs two or more pieces of presentation information each in a manner in which lower limit information is associated with a food group identifier for identifying a food
 - 10 group corresponding to the lower limit information;
 - a response accepting unit that accepts response information for specifying whether or not food groups respectively corresponding to the two or more pieces of presentation information have been consumed in amounts greater than or equal to those specified by lower limit information
 - 15 respectively corresponding to the two or more pieces of presentation information;
 - a score acquiring unit that acquires a diversity score, which is a score regarding dietary diversity, using the response information accepted by the response accepting unit; and
 - 20 a score output unit that outputs the diversity score acquired by the score acquiring unit.
2. The dietary diversity determining apparatus according to claim 1, wherein the score acquiring unit acquires a diversity score based on the
- 25 number of food groups consumed in an amount greater than or equal to that specified by lower limit information.
3. The dietary diversity determining apparatus according to claim 2, wherein the two or more food groups are 10 food groups.

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4. The dietary diversity determining apparatus according to claim 1,
wherein lower limit information for each of two or more food groups is
stored in the lower limit storage unit in association with two or more user
conditions using one or more user attribute values,

5 the dietary diversity determining apparatus further comprises:

an instruction accepting unit that accepts an output
instruction, which is an instruction associated with one or more user
attribute values and is an instruction to output two or more pieces of
presentation information; and

10 a presentation information acquiring unit that acquires lower
limit information for each of two or more food groups corresponding to a user
condition that is met by one or more user attribute values associated with the
output instruction, from the lower limit storage unit, and acquires two or
more pieces of presentation information each in a manner in which a food
15 group identifier for identifying a food group corresponding to the lower limit
information is associated with the lower limit information, and

the presentation information output unit outputs the two or more
pieces of presentation information acquired by the presentation information
acquiring unit.

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5. The dietary diversity determining apparatus according to claim 4,
wherein the one or more user attribute values include a race identifier for
identifying a race of a user, a residence identifier for identifying a place of
residence of a user, a food culture identifier for identifying a food culture, or
25 overall amount information on the overall amount of food intake in a user.

6. The dietary diversity determining apparatus according to claim 1,
further comprising:

a risk storage unit in which risk information on a risk to a person is
30 stored in association with a diversity score;

a risk acquiring unit that acquires risk information corresponding to a diversity score output by the score output unit, from the risk storage unit; and

5 a risk output unit that outputs the risk information acquired by the risk acquiring unit.

7. The dietary diversity determining apparatus according to claim 6, wherein, in the risk storage unit,

10 two or more pieces of risk information are stored, and a pair of risk information on one of two or more risks and degree information for specifying a degree to which the risk is likely to occur is stored in association with a diversity score,

the risk acquiring unit acquires risk information and degree information that correspond to a diversity score output by the score output unit, from the risk storage unit, and

15 the risk output unit outputs the risk information and the degree information acquired by the risk acquiring unit.

8. The dietary diversity determining apparatus according to claim 1, further comprising:

20 an advice storage unit in which advice information associated with an advice condition using a diversity score and one or more pieces of response information is stored;

25 an advice acquiring unit that acquires advice information corresponding to an advice condition that is met by a diversity score output by the score output unit and one or more pieces of response information accepted by the response accepting unit, from the advice storage unit; and

an advice output unit that outputs the advice information acquired by the advice acquiring unit.

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9. The dietary diversity determining apparatus according to claim 1,
wherein the response accepting unit accepts a set of two or more
pieces of response information on different days from one user, and
the dietary diversity determining apparatus further comprises:

5 a statistical processing unit that performs statistical
processing on the set of two or more pieces of response information, thereby
acquiring a statistical processing result; and
a statistical output unit that outputs the statistical processing
result acquired by the statistical processing unit.

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10. A sheet comprising two or more pieces of presentation information
each in a manner in which a food group identifier for identifying a food group
is associated with lower limit information for the food group, and a field that
accepts input of response information for each of the two or more pieces of
15 presentation information.

11. A dietary diversity determining method realized using a lower limit
storage unit in which lower limit information for specifying an appropriate
intake lower limit amount for each of two or more food groups is stored, a
20 presentation information output unit, a response accepting unit, a score
acquiring unit, and a score output unit, the method comprising:

a presentation information output step of the presentation
information output unit outputting two or more pieces of presentation
information each in a manner in which lower limit information is associated
25 with a food group identifier for identifying a food group corresponding to the
lower limit information;

a response accepting step of the response accepting unit accepting
response information for specifying whether or not food groups respectively
corresponding to the two or more pieces of presentation information have
30 been consumed in amounts greater than or equal to those specified by lower

limit information respectively corresponding to the two or more pieces of presentation information;

a score acquiring step of the score acquiring unit acquiring a diversity score, which is a score regarding dietary diversity, using the response

5 information accepted in the response accepting step; and

a score output step of the score output unit outputting the diversity score acquired in the score acquiring step.

12. A recording medium on which a program is recorded, the program

10 causing a computer capable of accessing a lower limit storage unit in which lower limit information for specifying an appropriate intake lower limit amount for each of two or more food groups is stored, to function as:

a presentation information output unit that outputs two or more pieces of presentation information each in a manner in which lower limit

15 information is associated with a food group identifier for identifying a food group corresponding to the lower limit information;

a response accepting unit that accepts response information for specifying whether or not food groups respectively corresponding to the two or more pieces of presentation information have been consumed in amounts

20 greater than or equal to those specified by lower limit information respectively corresponding to the two or more pieces of presentation information;

a score acquiring unit that acquires a diversity score, which is a score regarding dietary diversity, using the response information accepted by the

25 response accepting unit; and

a score output unit that outputs the diversity score acquired by the score acquiring unit.