Glossary

25 hydroxy-vitamin-D  The main (active) form of vitamin D in the blood, which serves as an indicator of vitamin D status.

Abdominal obesity  See central obesity.

Absolute risk (or absolute risk reduction)  The rate of a defined attribute (such as the prevalence or incidence of a disease) among the group exposed minus that among the non-exposed.

Acetylcholine  One of a group of chemicals known as neurotransmitters. Found throughout the brain, acetylcholine enables nerve cells to communicate with each other.

Acute coronary syndromes  Denotes symptoms occurring when decreased blood flow to the coronary arteries results in an area of the heart being unable to function. Can cause hospitalisation for unstable angina, thrombolysis for suspected myocardial infarction or an emergency revascularisation procedure for relief of ischaemic chest pain at rest.

Adenosine monophosphate (AMP)  An intermediary substance formed during the body's process of creating energy in the form of adenosine triphosphate from food.

Adenosine triphosphate (ATP)  The energy store for all cell processes. The breakdown of ATP to adenosine diphosphate or adenosine monophosphate, releases phosphate groups and usable energy in the cell.

Adhesion molecules  Molecules expressed on the cell surface that are involved in the direct binding of one cell to another cell or to specific substrates (e.g. glycoproteins).

Adipocyte  A fat cell.

Adipogenesis  The process of cell differentiation by which pre-adipocytes become adipocytes.

Adipokines  Substances (e.g. cytokines, growth factors, enzymes, hormones) that emanate from, or are expressed in, adipose tissue.

Adiponectin  A hormone produced and secreted exclusively by adipocytes (fat cells) that regulates the metabolism of lipids and glucose. Adiponectin improves the body's response to insulin and has anti-inflammatory effects on the cells lining the walls of blood vessels.

Adipose cell  A fat-storing cell.

Adipose tissue  Tissue found under the skin and around the body organs that is composed of fat-storing cells.

Adiposity  An indicator of the extent of fat in the body.

Adiposity rebound  The age at which young children begin to increase their body fat stores. Research has suggested that this may be a useful predictor of the development of obesity, with those experiencing the rebound at a younger age running an increased risk of subsequent obesity.

Adipsin  A protein secreted by adipose tissue.

Adrenaline  A hormone released in response to stress.

Advanced glycation end-products (AGEs)  Highly oxidant compounds produced as part of normal metabolism, but if excessively high levels are reached in tissues and the circulation, they can become pathogenic in several chronic diseases.

Alleles  Alternative forms of a gene. A single allele is inherited separately from each parent.
Android obesity  See central obesity.
Aneurysm A localised, pathological, blood-filled dilatation of a blood vessel caused by a disease or weakening of the vessel’s wall.
Angina A tight pain (typically across the chest), with or without breathlessness, caused by an inadequate supply of oxygen to the heart muscle. Angina is often triggered by exercise, stress, or cold weather.
Angiogenesis The process of developing new blood vessels.
Angiotensin-converting enzyme (ACE) An enzyme that converts angiotensin I to a biologically active form, angiotensin II.
Angiotensin-converting enzyme (ACE) inhibitor A drug that blocks the action of angiotensin-converting enzymes. It reduces the constriction of the blood vessels, veins, and arteries, resulting in the lowering of blood pressure; therefore ACE inhibitors are used to combat hypertension.
Angiotensinogen A protein produced by the liver involved in vasoconstriction (narrowing of blood vessels). Excess production is often implicated in high blood pressure.
Antigen A substance (usually a protein that is foreign to the body) that causes the formation of antibodies.
Antioxidant A compound that prevents or protects against the damage which could be caused by the oxidation of fatty acids and proteins.
Apelin An adipokine found in the central nervous system and periphery tissues, which is involved in regulating the cardiovascular system.
Apolipoprotein A protein that transports fat-soluble substances in the blood.
Apolipoprotein A-I (apoA-I) The primary protein constituent of high-density lipoprotein. It is also found in chylomicrons. Increased levels of apoA-I are associated with reduced risk of coronary heart disease.
Apolipoprotein B (apoB) One of the proteins of the low-density lipoprotein which transports lipid and cholesterol to the tissues. Also present in very low-density lipoprotein.
Apolipoprotein E (apoE) Occurs in all types of lipoproteins and is thought to be involved in the conversion of very low-density lipoproteins to intermediate-density lipoproteins and the removal of low-density lipoproteins from the circulation.
Apoptosis Programmed cell death (‘suicide’).
Arachidonic acid An unsaturated 20 carbon fatty acid obtained in the diet from animal fats or synthesised in the body from a dietary source of linoleic acid. Used to synthesise molecules such as prostaglandins and thromboxanes.
Arterial stiffness An independent predictor of cardiovascular disease risk, which is associated with ageing and structural changes in the vascular wall.
Arrhythmia Any form of irregular electrical activity in the heart leading to irregular heartbeats. It can be intermittent or continuous.
Atherogenic Having the capacity to start or accelerate the process of atherogenesis or the formation of lipid deposits in the arteries.
Atherogenic lipoprotein phenotype (ALP) A heritable trait characterised by a predominance of small, dense low-density lipoprotein particles, increased levels of triglyceride-rich lipoproteins, reductions in high-density lipoproteins and an increased risk of myocardial infarction.
Atheroma Fatty and fibrous deposits which build up in the inner lining of an artery wall.
Atherosclerosis The process in which fatty and fibrous deposits cause thickening and hardening of the arterial walls.
Atherosclerotic plaque Area within an artery wall that has been affected by atherosclerosis.
Attributable risk A measure of the excess risk between the exposed and the non-exposed in a population.
Autocrine Pertaining to cell messengers that act within the cell in which they are produced (cf. endocrine).
Bias Systematic deviation of study results from the true result, due to the way(s) in which the study is conducted.
Biomarker A biological marker which indicates a physiological state and may indicate the presence of a disease or condition.
Blood pressure A measure of the force that the circulating blood exerts on the walls of the main arteries. The pressure wave transmitted along the arteries with each heartbeat is felt as the pulse – the highest (systolic) pressure is created by the heart contracting, and the lowest (diastolic) pressure is measured as the heart fills.
Body mass index (BMI) An index of obesity calculated as weight in kilogrammes divided by the square of height in metres ($w/h^2$).
C-reactive protein (CRP) A protein present in plasma which is produced by the liver in response to inflammation.

Cardiometabolic disease Cardiovascular disease, type 2 diabetes, and obesity.

Cardiomyocyte The muscle cells making up the cardiac (heart) muscle.

Cardiovascular disease A disease of the heart or circulation. This broad term encompasses coronary heart disease, peripheral vascular disease, and stroke.

Carotenoids A group of red, orange, and yellow pigments found in plant foods and in the tissues of organisms that consume plants. Some, but not all, can act as precursors of vitamin A.

Case–control study A study that compares people with a disease or condition (‘cases’) to another group of people from the same population who do not have that disease or condition (‘controls’).

Catecholamines Amines derived from the amino acid tyrosine, including adrenaline (epinephrine), noradrenaline (norepinephrine), and dopamine, which act as hormones or neurotransmitters.

Central obesity/central adiposity/abdominal obesity/android obesity Accumulation of fat around the abdominal (stomach) region. Also known as abdominal obesity, upper-body obesity or ‘apple’ body shape. This is associated with an elevated risk of cardiovascular disease and is more common in some ethnic groups (e.g. South Asians) (cf. lower-body obesity).

Cerebrovascular disease See stroke.

Chemokine A family of cytokines involved in a wide variety of processes, including acute and chronic types of inflammation, infectious diseases, and cancer, which mobilise and activate leukocytes.

Chemotaxis Directed movement of cells in response to a concentration gradient of a chemical substance such as chemokines or cytokines.

Cholesterol A fat-like substance found in the bloodstream as well as in bodily organs and nerve fibres. Most cholesterol in the body is made by the liver. It is an essential constituent of cells, but when present in excess becomes a key component in the development of atherosclerosis.

Chylomicron Circulating lipid particles defined by size, density, and apolipoprotein content. Large particles composed mainly of triglycerides and cholesterol recently absorbed from a meal, which are delivered to muscle, adipose tissue, and the liver.

Cis fatty acid The form of most naturally occurring unsaturated fatty acids, where the hydrogen bonds are adjacent to each other on the same side of double bonds, resulting in a bend in the hydrocarbon chain at that point (see trans fatty acids).

Coagulation of the blood The process whereby bleeding (or haemorrhage) is normally arrested in the body and blood forms a gel-like semi-solid mass known as a clot. Coagulation is part of the process of haemostasis, which is the arrest of bleeding from an injured or diseased blood vessel.

Complement System of serum proteins and a group of membrane proteins that interact in a complex cascade reaction sequence. Involved in the control of inflammation, the destruction of cell membranes and the activation of phagocytes.

Confidence interval (CI) The range of values within which we can be sure to a selected degree of certainty (normally 90%, 95%, or 99%) that the true answer lies. Wide confidence intervals reflect a lot of uncertainty about the value and arise from small sample sizes and/or large variability.

Confounding Occurs when an observed association (or lack of one) is, in fact, due to a mixing of effects with a third factor that is associated with both the exposure and the disease, meaning that the individual effect of the exposure cannot be separated.

Coronary arteries The arteries supplying blood to the muscle of the heart.

Coronary heart disease (CHD) (or ischaemic heart disease) Heart disease resulting from the build-up of fatty deposits in the lining of the coronary arteries. It may cause angina, a heart attack, or sudden death.

Correlation Two variables are said to correlate if variation in one is systematically accompanied by variation in the other. If one increases as the other does, this is a positive correlation. If one increases as the other decreases, this is a negative correlation.

Correlation coefficient A number between −1 and 1 that measures the degree to which two variables are linearly related. Values approaching
1 indicate that there is a strong positive relationship between the variables. Values approaching −1 indicate that there is a strong inverse relationship. Values around zero indicate there is no relationship at all.

**Corticotrophin**  A hormone produced by the pituitary gland (also known as ACTH) which stimulates the adrenal gland to produce cortisol.

**Cortisol**  The body’s primary stress hormone.

**Cytokines**  Small, hormone-like proteins released by leukocytes, endothelial cells, and other cells to promote an inflammatory immune response to an injury.

**Cytotoxic**  A substance that is harmful to cell structure and function, and ultimately causes cell death.

**D-dimer**  A fragment produced during the degradation of a clot.

**De novo**  Anew. Often used in relation to the synthesis of biological materials within the body from smaller components.

**Developmental origins of health and disease (DOHaD)**  The concept that nutrition and other environmental factors during early life (fetal and infant) development permanently alter (‘programme’) the body’s structure and metabolism, and thus have important effects on health and risk of disease in adulthood.

**Dietary reference values**  Estimates of the amount of energy and nutrients needed by different groups of healthy people in the population.

**Dimer**  A molecule that consists of two similar (but not necessarily identical) subunits.

**Docosahexaenoic acid (DHA)**  A long-chain n-3 (omega-3) fatty acid that is abundant in oil-rich fish (see also eicosapentaenoic acid).

**Dyslipidaemia**  An abnormal concentration in the blood of one or more lipids, such as an elevated low-density lipoprotein cholesterol level or a depressed high-density lipoprotein cholesterol level.

**Dysplasia**  Cells that look abnormal under a microscope but are not cancer (see also hyperplasia). Hyperplasia and dysplasia may or may not become cancer.

**Ecological study**  A study based on aggregated data from a given population designed to investigate the relationship between an exposure and an outcome.

**Eicosanoids**  Compounds formed in the body from long-chain (20-carbon) polyunsaturated fatty acids. Examples include prostaglandins, leukotrienes, and thromboxanes. These compounds act as local hormones and are involved in the control of blood pressure, blood clotting, inflammation, and a variety of other processes.

**Eicosapentaenoic acid (EPA)**  A long-chain n-3 (omega-3) fatty acid that is abundant in oil-rich fish (see also docosahexaenoic acid).

**Endocrine**  Pertaining to hormones and the glands that make and secrete them into the bloodstream through which they travel to affect distant organs (cf. autocrine).

**Endogenous**  Originating from within the body (cf. exogenous).

**Endothelium**  The membrane lining various vessels and cavities of the body, including the heart and blood vessels. It consists of a fibrous layer covered with thin flat cells, which renders the surface perfectly smooth and secretes the fluid for its lubrication.

**Enzyme**  Protein that speeds up (catalyses) a metabolic reaction in vivo or in vitro.

**Epigenetic**  Describes a factor or mechanism that changes the expression of a gene or genes without changing their DNA sequence. In more general terms, an epigenetic factor is something that changes the phenotype without changing the genotype.

**Euglycaemic clamp (or hyperinsulinaemic clamp)**  A way to quantify how sensitive the tissue is to insulin, which requires maintaining a high insulin level infusion with insulin.

**Exogenous**  Originating from outside the organism. For example, insulin taken by someone with diabetes is exogenous insulin (cf. endogenous).

**Factor V Leiden**  A mutation of the (coagulation) factor V gene that results in increased risk of a thrombosis in veins (blood clot).

**Factor VII**  A circulating protein made by the liver that is one (of about 40) of the factors involved with blood clotting.

**Familial hypercholesterolaemia**  An inherited condition characterised by abnormally high cholesterol levels in the blood. Affected individuals are unable to process low-density lipoprotein cholesterol properly, and they are at increased risk for coronary heart disease.

**Fatty streaks**  Fatty deposits in the lining of artery walls that can lead to atherosclerosis.
Fetal origins of adult disease (FOAD) or thrifty phenotype hypothesis A hypothesis that suggests that the association between small size at birth and subsequent development of cardiovascular disease and its risk factors (e.g. glucose intolerance, increased blood pressure, dyslipidaemia, obesity) reflects permanent effects of fetal undernutrition.

Fibrin The protein formed during normal blood clotting that is the essence of a clot.

Fibrinogen The soluble, circulating precursor of the insoluble blood clotting protein, fibrin.

Fibrinolysis The way in which blood clots are dissolved by enzymes, either by the body or drug intervention.

Fibrinopeptide A Released as part of the clotting process. An elevated level may indicate an abnormal clotting process.

Fibroblast A cell from which connective tissue is developed. It makes and secretes collagen.

Fibronectin An adhesive glycoprotein that is found in connective tissue, where it cross-links to collagen, and is also involved in blood clotting.

Flavonoid A group of compounds naturally occurring in plant foods such as fruit, vegetables, tea, coffee, wine, cocoa, oils, and grains.

Foam cells Lipid-laden cells, often derived from white blood cells, named for their foamy appearance under the microscope, which may contribute to the development of atherosclerotic lesions.

Folate/folic acid A vitamin found in green leafy vegetables (especially sprouts, spinach, green beans, peas), potatoes, fruit (especially oranges), milk, and dairy products. A synthetic form (folic acid) is also found in some fortified foods (e.g. breakfast cereals, bread, yeast extract) and in vitamin supplements.

Framingham risk score A clinical tool for assessing an individual’s 10-year risk of cardiovascular disease, based on factors including gender, age, smoking, blood pressure, and blood lipid profile.

Free fatty acids See non-esterified fatty acids.

Free radical Molecules that contain an unpaired electron and are therefore highly reactive.

Free sugars (added sugars) Sugars added to foods by the cook, manufacturer, or consumer (including table sugar, honey, syrups, and nectars) and sugars present in fruit juice. Sugars present within whole fruits and vegetables and plain dairy foods are not free sugars.

Gestational diabetes The condition in which glucose intolerance is acquired during pregnancy.

Gene Unit of heredity in a chromosome controlling a particular inherited characteristic of an individual.

Genetic Inherited; a genetic disease is one that is inherited via a faulty gene.

Genome wide association study (GWAS) A type of study which compares highly variable parts of the DNA sequence between people to find genetic variations associated with a particular disease.

Genotype The genetic constitution (the genome) of a cell, an individual, or an organism. The genotype is distinct from its expressed features, or phenotype (cf. phenotype).

Ghrelin A hormone primarily produced by the stomach that increases appetite and stimulates the release of growth hormone from the pituitary gland.

Glucocorticoid Steroid hormones produced by the adrenal cortex that predominantly affect the metabolism of carbohydrates and, to a lesser extent, fats and proteins, and have other effects such as reducing inflammation. Cortisol is the major natural glucocorticoid in humans.

Glycaemic index (GI) A scale for evaluating foods, based on the rate at which sugar is absorbed into the bloodstream after eating a specific food.

Glycaemic load (GL) A scale for evaluating carbohydrate foods that takes into account both the quality and the amount of available carbohydrate it contains.

Glycogen A polymer of glucose, the form in which carbohydrate is stored, predominantly in the liver and skeletal muscle.

Granulocyte A type of white blood cell filled with microscopic granules containing enzymes that digest microorganisms. Neutrophils, eosinophils, and basophils are all types of granulocytes.

Growth factors Secreted regulatory proteins that control the survival, growth, differentiation, and effector function of cells.

Gynoid obesity Fat distribution mainly to the hips and thighs.

Hard endpoint Measurement of a clinical outcome (e.g. heart attack, stroke, or death) (cf. surrogate marker).
Hazard ratio  The probability of an individual in a treatment group experiencing an event (e.g. death, relapse) at a particular point in time after an intervention, compared to the probability of the same event happening in a control group.

Heterogeneous (heterogeneity)  Denotes dissimilarity. This term can be used to denote the discrepant results obtained within or between epidemiological studies or randomised trials that can be either statistical (meaning that studies used different statistical methods) or clinical (meaning that studies evaluated different types of subjects, treatments, or outcomes) (cf. homogeneous).

High-density lipoprotein (HDL)  Circulating lipid particles which transport cholesterol from cells to the liver, where they are degraded or repackaged. HDLs remove excess cholesterol from tissues, preventing a build-up of cholesterol on the artery walls hence HDL may be referred to as ‘good’ cholesterol.

Homocysteine  A sulphhydryl amino acid derived from the metabolic conversion of methionine, which is dependent on vitamins (folate, B₁₂ and B₆) as cofactors or cosubstrates.

Homocystinuria  A congenital disease in which an affected individual is unable to metabolise or use methionine properly. The main features of the condition are abnormality of the lens of the eye, mental retardation, fair complexion, fair hair, and a high cheek colour.

Hormone  A circulating substance secreted by a gland that influences another organ.

Hypercholesterolaemia  Concentrations of cholesterol in the blood higher than normal (or reference) values. Causes include dietary and genetic.

Hyperglycaemia  A greater than normal concentration of glucose in the blood, most frequently associated with diabetes.

Hyperinsulinaemia  High blood insulin levels.

Hyperlipidaemia  High levels of fats (lipids) in the blood.

Hyperphagia  An abnormally increased appetite; excessive eating.

Hyperplasia  An increase in the number of cells in an organ or tissue. These cells appear normal under a microscope. They are not cancer, but may become cancer (see also dysplasia).

Hypertension  Elevated blood pressure (usually defined as a blood pressure of 140/90 mmHg or above).

Hypertriglyceridaemia  Concentrations of triglycerides in the blood higher than normal (or reference) values.

Hypertrophy  Enlarging of cells or an organ. May be used in distinction to hyperplasia.

Hypoglycaemia  The level of glucose in the blood being too low, usually under 2.5 mmol/l. Left untreated, hypoglycaemia will eventually result in a person becoming unconscious.

Hypothalamo-pituitary–adrenal (HPA) axis  Part of the central nervous system. The HPA axis or stress axis is a chain from the hypothalamus in the brain over the pituitary to the adrenal gland. It plays an important role in adaptation of organisms to stressful situations. Long-term functional alteration of the HPA axis has been linked with pathophysiological states such as diabetes and hypertension.

Hypothalamus  An area of the brain that acts as the centre for the autonomic nervous system, regulating sleep, temperature, eating, and sexual development. It also releases hormones and regulates the functions of the pituitary gland.

Hypoxia  A deficiency in the amount of oxygen reaching the tissues.

Impaired glucose tolerance (IGT)  A state that is borderline to diabetes and is associated with elevated risk of cardiovascular disease. IGT often progresses to diabetes in later life.

Imprinted genes  These genes have one allele that has been switched off during the early stages of life when the embryo is developing, therefore only a single allele is functioning.

In vitro  From the Latin meaning ‘in glass’. The term is applied to biological processes studied experimentally in isolation from the organism, as distinct from in vivo, which refers to the study of processes in the living organism (cf. in vivo).

In vivo  Observations carried out inside the living body of animals, including man (cf. in vitro).

Incidence  The rate at which new events occur in a population (i.e. the number of new cases of a disease in a specific period of time, divided by the total population at risk of getting the disease during that period) (cf. prevalence).

Infant mortality rate  Deaths during the first year of life per 1000 live births.

Inflammation  The reaction of the body to any injury, which may be the result of trauma, infection, or chemicals. In response, local
blood vessels dilate, increasing blood flow to the injured site, and white blood cells invade the affected tissue engulfing bacteria or other foreign bodies.

**Innate (or natural) immunity** Natural non-specific host defences (cf. specific immunity).

**Insulin** A hormone secreted by the pancreas in response to food intake. It circulates in the blood and assists in the movement of glucose into cells where it is used as a source of energy.

**Insulin-like growth factor (IGF)** A hormone that promotes growth with a chemical structure similar to insulin. While insulin primarily affects the body’s metabolic system (energy delivery and use), IGF helps regulate cell growth.

**Insulin resistance** A condition in which the body’s cells are less responsive (or sensitive) to the action of insulin. This causes more insulin to be released by the pancreas, resulting in an excess amount of insulin circulating in the blood. This metabolic abnormality underlies type 2 diabetes.

**Insulin resistance syndrome** See metabolic syndrome.

**Insulin sensitivity** A measure of how much insulin is required for cells to import glucose. Patients with type 2 diabetes typically have insulin resistance (high insulin levels with high blood glucose).

**Interleukins** A group of cytokines. Molecules made by leukocytes that are involved in signaling between cells of the immune system.

**Intermediate-density lipoprotein (IDL)** Short-lived lipoproteins containing about 30% cholesterol that are converted in the circulation to low-density lipoproteins.

**Intima** The layer of the arterial wall that is nearest to the lumen and includes the endothelial cells.

**Intrauterine growth restriction** The faltering of growth in utero.

**Inulin** A non-digestible oligosaccharide often used as a prebiotic.

**Ischaemia** Reduced or inadequate blood, and thus oxygen, supply to a part of the body. Cardiac ischaemia (restricted blood and oxygen supply to the heart) could result from a heart attack.

**Ischaemic heart disease** See coronary heart disease.

**Isoforms** Alternative forms of a protein/enzyme.

**Isoprostanes** A marker of lipid peroxidation in the body.

**Leptin** A hormone produced by the LEP gene in humans [or the ob (obese) gene in rodents] and secreted by fat tissue that acts on the brain to regulate appetite and has a central role in fat metabolism.

**Leukocyte** A white blood cell found in blood and lymph nodes. During the inflammation process, the body uses leukocytes to fight infections and help repair damaged tissues. However, the body can improperly trigger the inflammatory-response process, causing leukocytes to attack healthy tissue. These situations can result in a large range of conditions, including heart disease.

**Lipaemia** The presence of a conspicuous amount of fat in the blood, for example, after a fat-rich meal.

**Lipase** An enzyme that breaks down fat.

**Lipid** A collective name for fats, oils, cholesterol, and other fatty substances.

**Lipogenesis** Synthesis of fatty acids and lipids (cf. lipolysis).

**Lipolysis** Also referred to as beta-oxidation, is the breakdown of fats and other lipids by hydrolysis to release fatty acids (cf. lipogenesis).

**Lipoprotein** Fat particles with associated proteins that facilitate cholesterol and triglyceride transport throughout the body. The four basic classes are high-density, low-density and very-low-density lipoproteins, and chylomicrons.

**Lipoprotein(a) or Lp(a)** A lipoprotein particle similar to low-density lipoprotein cholesterol with an attached protein. Studies have suggested an association between elevated blood levels of Lp(a) and an increased risk of heart disease.

**Lipoprotein lipase** The enzyme that catalyses the breakdown of lipids in the bloodstream through the hydrolysis of linkages between fatty acids and glycerol in triglycerides and phospholipids.

**Logistic regression** When the distribution of a dependent variable depends upon the value of some other variable(s), the expected value of the dependent variable is given by a mathematical relationship called the regression of the dependent variable (e.g. rate of disease) on the independent variable(s). In logistic regression, the dependent variable is an expression of the odds of the occurrence of a disease or other attribute of interest.
**Low birthweight** Usually defined as infant birthweight below 2500 g.

**Low-density lipoprotein (LDL)** The particles that deliver cholesterol to tissues where it is needed for membrane structure or to manufacture steroid hormones and bile acids. Too much LDL-cholesterol in the blood leads to a build-up of cholesterol (referred to as plaques) in the artery walls, hence LDL-cholesterol is referred to as ‘bad’ cholesterol.

**Lower-body obesity** Accumulation of fat around the hips, thighs, and bottom (also called a ‘pear’ body shape) (cf. central obesity).

**Lower reference nutrient intake** The amount of a nutrient that is enough for only a small proportion of people in a group who have low requirements (2.5%), therefore the majority of the group will need more.

**Lymphocyte** A small white blood cell (leukocyte) that plays an important role in defending the body against disease. There are two main types of lymphocytes: B cells and T cells. B lymphocytes produce antibodies, while T lymphocytes attack and destroy antigens directly.

**Macrophage** A large white blood cell that has scavenger properties and normally collects at infection sites to remove foreign bodies. It is also involved in the development of atherosclerotic lesions.

**Malondialdehyde (MDA)** A biomarker of oxidative stress.

**Media** The middle layer in the artery wall. It is composed of smooth muscle cells that control the diameter of the artery.

**Meta-analysis** A discipline that reviews critically and combines statistically the results of previous research in an attempt to summarise the totality of the evidence relating to a particular medical issue.

**Metabolic equivalent of task (MET)** The energy expenditure at rest. METs are used to describe the energy cost of an activity, for example an activity that requires three times the rate of energy expenditure than resting would be described as 3 METs.

**Metabolic syndrome** Refers to a set of heart disease risk factors which have been found to occur together causing a substantial increase in the risk of a heart attack. This is also known by other names like syndrome X, Reaven’s syndrome and insulin resistance syndrome.

**Metalloproteinases** A group of enzymes responsible for breaking down and reforming body tissues, and breaking down and removing dead matter.

**Methionine** An amino acid found in protein-rich foods, such as meat, fish, and dairy products.

**Methyl-tetrahydrofolate reductase (MTHFR)** An enzyme that is required to convert homocysteine to methionine. Impaired activity of this enzyme results in increased blood levels of homocysteine.

**Microalbuminuria** Excretion of small amounts of the protein albumin, found in urine tests.

**Microbiome** The microorganism community in a particular environment, including genetic components, microbial diversity, and its functionality.

**Microcirculation** Blood vessels with a diameter of <150μm, including arterioles, capillaries, and venules.

**Monocyte** A type of white blood cell that circulates in the blood. They are transformed into macrophages in the artery wall.

**Monomer** Individual unit from which polymers are made.

**Monounsaturates (monounsaturated fatty acids)** Fatty acids containing one double bond.

**Multivariate analysis** Statistical analysis containing one dependent variable and several independent variables (cf. univariate analysis).

**Murine** Relating to or affecting mice or related rodents.

**Mutation** A heritable change in genetic material (i.e. a change which can potentially be passed from parent to child). This change may occur in a gene or in a chromosome, and may take the form of a chemical rearrangement, or a partial loss or gain of genetic material.

**Myocardial infarction (MI)** A heart attack which occurs when an artery to the heart muscle is blocked.

**Myocardium** The muscular substance of the heart.

**n-3 (or omega-3) polyunsaturates** Fatty acids with their first double bond at the third carbon atom from the methyl end (–CH₃) of the molecule. These include alpha-linolenic acid (C18:3) (sources of which include rapeseed, walnut, soya, and blended vegetable oils), eicosapentaenoic acid (C20:5), and docosahexaenoic acid (C22:6) (the main sources of which are oil-rich fish) (see also eicosapentaenoic acid and docosahexaenoic acid).
**n-6 (or omega-6) polyunsaturates**  Fatty acids with their first double bond at the sixth carbon atom from the methyl end (–CH₃) of the molecule. These are the typical fatty acids of vegetables oils (e.g. sunflower, corn, and soybean) and spreads made from these.

**Natural killer cell**  A lymphocyte that kills targets such as certain tumour cells.

**NCEP-I**  National Cholesterol Education Program Step One diet (20% fat).

**Necrosis**  Uncontrolled cell death.

**Neonatal**  During the first 28 days after birth.

**Neural tube defects**  Birth defects that occur when the neural tube does not form correctly. Neural tube defects usually occur during the first month of pregnancy, before many women know they are pregnant.

**Neurotransmitter**  Chemical messenger that transmits nerve signals (impulses) from one nerve cell to another.

**Neutrophil**  A type of white blood cell that can act as a phagocyte. Neutrophils are the most numerous cell type in the bloodstream and the major cell type found in acute inflammatory lesions.

**Nitric oxide (NO)**  Perhaps more correctly known as nitrogen monoxide. A mediator of many physiological responses including vascular function.

**Non-esterified fatty acids (free fatty acids)**  Fatty acids that are free in the bloodstream rather than esterified to glycerol.

**Non-starch polysaccharide**  Plant wall constituents that are not digested or absorbed in the small intestine and are therefore classed as a type of dietary fibre.

**Noradrenaline**  A neurotransmitter released by nerve terminals, particularly known to be concerned with states of arousal.

**Omentum**  A layer of peritoneum that surrounds abdominal organs.

**Osteoblastogenesis**  The production of osteoblasts, the cells that make bone.

**Oxidation**  A chemical reaction that involves the loss of electrons; it usually, but not always, involves direct participation of oxygen.

**Oxidative stress**  A condition in which the production of oxidants and free radicals exceeds the body’s ability to inactivate them.

**Parasympathetic system**  A part of the autonomic nervous system (cf. sympathetic system) that slows heart rate, dilates blood vessels, increases intestinal activity, and relaxes muscles in the gastrointestinal tract.

**Peripheral artery disease (PAD)**  A narrowing of arteries in the limbs due to a build-up of fatty deposits (atherosclerosis).

**Peripheral neuropathy**  A condition resulting from injury to the peripheral nerves in the body that carry signals between the central nervous system (the brain and spinal column) and the muscles, skin, and internal organs. When peripheral neuropathy first develops, people often report a tingling or prickling in the toes, although it may also start in the fingers. Over time, this tingling may gradually spread up the feet or hands and worsens into a burning, shooting, and/or throbbing pain. People who have severe peripheral neuropathy may experience extreme pain and may have difficulty walking.

**Peripheral vascular disease (PVD)**  This often co-exists with coronary heart disease and causes pain in leg muscles following exertion.

**Peroxides**  Free radicals that result from the reaction between fatty acids and oxygen.

**Peroxisome proliferator-activated receptors (PPARs)**  Members of the nuclear hormone receptor family. Three subtypes of PPAR have been described, alpha, beta (also called delta) and gamma, encoded by different genes.

**Peroxynitrite**  A nitrogen reactive species (ONOOH) formed by the reaction between...
nitric oxide and superoxide under inflammatory conditions.

**Phagocytosis** A process whereby cells engulf and destroy foreign material (e.g. bacteria, cells, cell debris, and other small particles). Cells that act in this way are called phagocytes.

**Phenotype** The physical characteristics of an individual that result from the combination of genetic and environmental factors. By contrast, the genotype is merely the genetic constitution (genome) of an individual (cf. genotype).

**Physical fitness** A set of attributes (e.g. cardiorespiratory endurance, skeletal muscle endurance, skeletal muscle strength and power, flexibility, agility, and balance) that people have or acquire that relate to the ability to perform physical activity.

**Plasminogen** A precursor of plasmin, an enzyme that digests the protein fibrin, the main constituent of blood clots.

**Plasminogen activator inhibitor-1** An inhibitor of the fibrinolytic system. It is biologically plausible that elevated levels could suppress fibrinolysis and result in an increased risk of thrombosis (blood clots).

**Platelet aggregation** The process by which platelets are induced to clump together and form aggregates. These become enmeshed in the fibrin network and form a blood clot.

**Platelets** Small blood cell fragments that are involved in blood clotting.

**Pleiotropic** Having multiple effects. For example, for statins, there would be effects other than cholesterol lowering, such as improving or restoring endothelial function, enhancing the stability of atherosclerotic plaques, decreasing oxidative stress and inflammation, and inhibiting the thrombogenic response in the vascular wall.

**Polygenic disease** Genetic disorders (e.g. heart disease, diabetes, and some cancers) resulting from the combined action of alleles of more than one gene. Although such disorders are inherited, they depend on the simultaneous presence of several alleles; thus, the hereditary patterns are usually more complex than those of single-gene disorders.

**Polymorphism** The existence of variation of a genetic characteristic in a population that is too common to be due merely to new mutation. A polymorphism must have a frequency of at least 1% in the population.

**Polyphenols** A group of chemical substances found in plants, characterised by the presence of more than one phenol group per molecule. Polyphenols are generally further subdivided into tannins, and phenylpropanoids such as lignins and flavonoids.

**Polyunsaturates (polyunsaturated fatty acids)** Fatty acids containing two or more double bonds; common in vegetable oils (see also n-3 and n-6 polyunsaturates).

**Population attributable risk (or attributable fraction)** A measure of the impact an exposure or risk factor has in a given population, in terms of excess risk of disease. It depends not only on how strongly the exposure in question is associated with a particular disease but also on the prevalence of the exposure/risk factor.

**Postprandial** After a meal.

**Preadipocyte-factor1 (pref-1)** A preadipocyte-secreted factor that inhibits adipogenesis.

**Prebiotic** A substrate that is selectively utilized by host microorganisms conferring a health benefit.

**Precocious** Unusually early development.

**Premature heart disease** Heart disease before the age of 75 years.

**Pressure natriuresis** Increased urinary excretion of sodium along with water when there is an increase of arterial pressure, a compensatory mechanism to maintain blood pressure within the normal range.

**Prevalence** A measure of the total number of existing cases of a disease or condition at a particular point in time (or during some specified time period). Prevalence is usually expressed as a percentage of the total population, or per 1000, 10 000, or 100 000 people (cf. incidence).

**Primary prevention** Measures taken to prevent someone from developing a disease (e.g. modifying the diet to reduce coronary risk before there are signs of heart disease).

**Probiotic** Live microbial feed supplements that are suggested to improve consumer gut health.

**Prospective study** Data on exposure is first collected and subjects are followed up for the development of a given condition or outcome. A randomised controlled trial, for example, is always prospective. (cf. retrospective study).
**Prostacyclin**  The prostaglandin hormone PGI₂, a natural hormone made by normal artery wall lining cells to inhibit the formation of abnormal blood clots.

**Prostaglandins**  A type of eicosanoid. These hormone-like substances participate in a wide range of body functions. They have several actions as inflammatory mediators, particularly those derived from the n-6 fatty acid, arachidonic acid, such as prostaglandin E₂.

**Proteoglycans**  Proteins conjugated with carbohydrate groups.

**Prothrombin**  A protein blood coagulation factor; also known as factor II; the precursor of the clotting enzyme thrombin.

**Prothrombotic state**  Implies an imbalance between coagulation and fibrinolysis that favours fibrin deposition and clot formation.

**Randomised controlled trial (RCT)**  In a randomised controlled trial, participants are assigned by chance to receive either an experimental or control treatment. Both groups are followed up for a specified time and the effects of the intervention on a specific outcome (e.g. serum cholesterol level, death rates) are analysed. The idea behind the randomised controlled trial is that when it is done properly, the effect of a treatment can be studied in groups of people who are the same at the outset and treated the same way except for the intervention being studied. Any differences then seen in the groups at the end can be attributed to the difference in treatment alone, and not to bias or chance.

**Reactive oxygen species (ROS)**  A collective term that includes free radicals of oxygen and nonradical derivatives of oxygen, such as hydrogen peroxide and singlet oxygen.

**Reference nutrient intake**  The amount of a nutrient that is enough to ensure that the needs of nearly all of a group (97.5%) are being met.

**Regression dilution**  A term that describes the dilution/attenuation of the estimated relationship between two variables when a single measured value is used instead of the usual or average value over a period of time.

**Relative risk**  The rate of a defined attribute among the group exposed, divided by that among the non-exposed.

**Remnant-like particles (RLP)**  Remnant-like particles include all apoB48-containing lipoproteins plus a subfraction of apoB100-containing lipoproteins, the latter of which are enriched in apoE and cholesterol. RLPs are formed from the metabolism of very low-density lipoprotein and chylomicrons. Increased blood concentrations of RLP are observed in coronary heart disease, diabetes, hypertriglyceridaemia, and fatty liver disease.

**Renin**  An enzyme produced by the kidney and released into the blood in response to stress. It reacts with a compound in the liver to produce angiotensin which causes blood vessels to constrict and raises blood pressure.

**Resistin**  A protein (cytokine) secreted by adipose tissue which causes resistance of peripheral tissues to insulin.

**Reticular endothelial system**  A term for the network of phagocytes and endothelial cells throughout the body.

**Retrospective study**  In a retrospective study (e.g. a case–control study), the outcomes of a group of people are examined in hindsight, using existing records or recalling past exposure. Retrospective studies are generally limited in the data available for analysis, as the data have rarely been collected with the needs of that particular study in mind. This kind of limitation means that a retrospective study is usually less reliable than a prospective study (cf. prospective study).

**Reverse causality**  Arises when what was assumed to be the cause is in fact the effect, and vice versa. This concept is relevant in case–control studies when a disease or illness can cause individuals to change their behaviour, alter biochemical parameters, or have other effects.

**Reverse cholesterol transport**  The removal of cholesterol from cells and from atherosclerotic lesions. This process involves high-density lipoprotein cholesterol, which is often referred to as ‘good’ cholesterol.

**Risk factor/risk marker**  Characteristic found to be related to the subsequent occurrence of disease.

**Risk ratio**  The ratio of risk in the treated group to the risk in the control group – used in randomised trials and cohort studies.

**Saturates (saturated fatty acids)**  A fatty acid containing no carbon–carbon double bonds, typical of ‘hard’ fats and animal fats. (cf. unsaturates).

**Scavenger receptors**  Receptors on macrophages that recognise the modified forms of low-density lipoprotein particles.
Secondary prevention  Measures taken to limit the effects or progression of disease once it has occurred. For example, the use of a statin drug in individuals with heart disease to reduce the risk of a subsequent heart attack.

Sensitivity  The quality of being sensitive. In screening for a disease, this refers to the proportion of persons with the disease who are correctly identified by a screening test.

Small, dense low-density lipoprotein (LDL) particles  LDL particles vary with respect to their size, density, composition, and physicochemical properties. An increased proportion of small, dense LDL is associated with increased cardiovascular risk. This has been attributed to several factors, including greater susceptibility to oxidative modification and efficient infiltration into the arterial vessel wall.

Specificity  The quality of being specific. In screening for a disease, this refers to the proportion of persons without a disease who are correctly identified by a test.

Stable angina  Chest pain that is present only during exertion or extreme emotional distress and disappears with rest (cf. unstable angina).

Statin  A group of drugs that reduce the concentration of low-density lipoprotein cholesterol in the blood.

Stenosis  Narrowing of a vessel making flow of blood difficult.

Stroke (cerebrovascular disease)  Damage to part of the brain resulting from a breakdown in the blood supply (ischaemia) or haemorrhage. In the UK, around 85% of strokes are due to ischaemia, of which the major cause is thrombosis in the arteries supplying the brain.

Subcutaneous  Beneath the skin.

Superoxide dismutase  The enzyme that converts superoxide radicals ($O_2^-$) into hydrogen peroxide ($H_2O_2$).

Surrogate marker/measure  A laboratory measurement or physical sign that is used in intervention trials as a substitute for a clinically meaningful endpoint (e.g. elevated blood cholesterol levels as a marker of heart disease risk) (cf. hard endpoint).

Sympathetic nervous system  Part of the nervous system that prepares the body for activity by raising blood pressure and speeding up the heart rate.

Synbiotic  A combination of pro- and prebiotics

Systemic  Relating to, or affecting, the whole body.

Thiazolidinedione  A class of drugs used to treat type 2 diabetes that lower the blood sugar by increasing the sensitivity of cells to insulin. These drugs also increase high-density lipoprotein ('good') cholesterol.

Thiol  A sulphydryl (–SH) containing compound.

Thrifty genotype  The basic premise of the 'thrifty gene' hypothesis is that certain populations may have genes that determine increased fat storage, which in times of famine represent a survival advantage, but in a modern environment (with a high energy diet and physical inactivity) result in obesity, type 2 diabetes, and cardiovascular disease.

Thrombomodulin  An endothelial cell receptor with anticoagulant and anti-inflammatory effects.

Thrombosis  The pathological condition in which a blood clot blocks an artery or vein and stops the blood flow through it.

Thromboxane  A type of eicosanoid that causes blood to clot and increases the stickiness of platelets.

Thrombus  A pathological blood clot.

Tissue plasminogen activator (tPA)  An enzyme found in many tissues which converts plasminogen to plasmin, and therefore promotes the breakdown of a thrombus or blood clot in a blood vessel. tPA is used in the treatment of patients with a heart attack as a clot-dissolving drug.

Tocopherols  Forms of vitamin E.

Toll-like receptors  Proteins that can detect a broad range of microbes (including viruses, bacteria, fungi, and protists) as part of the immune response.

Total homocysteine  Blood total homocysteine is the sum of all protein-bound and free forms of homocysteine.

Trans fatty acids  Fatty acids with two of the hydrogen atoms on opposite sides of the double bond joining carbon atoms. Trans fatty acids occur naturally in small amounts in foods produced from ruminant animals, such as meat and dairy products, and can also be produced by the hydrogenation of vegetable oils but most trans fats from this source have been removed from the UK diet.

Transcription factor  A protein that controls when genes are switched on or off and whether genes are transcribed or not.
Glossary

Triglyceride (or triacylglycerol) A type of fat – the major type of fat in the diet, also present in the bloodstream.

Tumour necrosis factor-alpha (TNF-alpha) A cytokine produced by many types of leukocyte, named after its ability to kill tumour cells in tissue culture. It modifies the response of many cells and causes inflammation; it has been implicated in the pathology of a wide range of chronic inflammatory conditions including heart disease.

Type 1 diabetes Also known as insulin-dependent diabetes. A disease in which an autoimmune process in the pancreas leads to destruction of the insulin-producing islet cells, producing a form of diabetes characterised by insulin deficiency.

Type 2 diabetes Previously known as adult-onset diabetes and non-insulin-dependent diabetes. A disease in which there is both a failure of the body to respond normally to insulin (insulin resistance) and the body does not make enough insulin or is unable to make proper use of it, causing glucose concentrations to increase in the bloodstream.

Unsaturates (unsaturated fatty acids) Fatty acids containing one or more carbon–carbon double bonds (see also monounsaturates and polyunsaturates) (cf. saturates).

Unstable angina Chest pain which occurs frequently and easily at rest, feels severe and is long lasting (cf. stable angina). This is considered an acute coronary syndrome and may signal an impending heart attack. It may be a new symptom or a change from stable angina.

Vasoconstriction Narrowing of the blood vessels resulting from contracting of the muscular wall of the vessels. The opposite of vasodilation.

Vasodilation Widening of blood vessels resulting from relaxation of the muscular wall of the vessels. The opposite of vasoconstriction.

Ventricles Pumping chambers of the heart. The left ventricle pumps blood around the body and the right ventricle pumps blood to the lungs.

Very low-density lipoprotein (VLDL) A class of lipoproteins that transports triglycerides from the liver to the adipose and muscle tissues. They are produced mainly in the liver and primarily contain triglycerides in their lipid cores.

Visceral obesity Excess of body fat around the internal organs of the body, specifically those within the abdomen (e.g. liver or intestines).

VO₂max The maximum amount of oxygen that the body can utilise per minute of work. This is often used as an evaluation of a person’s cardiovascular efficiency.

von Willebrand factor (vWF) A protein involved in blood clotting that is produced by the vascular endothelium.

Zymogen An inactive biomolecule that is a precursor to an enzyme.