Contents

List of Figures

Part F: Scientific Literature Search Methodology

Background

Immediately after HHS Secretary Michael Leavitt announced plans for the development of federal physical activity guidelines on October 27, 2006, the Centers for Disease Control and Prevention (CDC) was assigned to support the Physical Activity Guidelines Advisory Committee's (PAGAC) review of the scientific literature. Working with an advisory committee, staff of the Division of Nutrition, Physical Activity and Obesity (DNPAO) at CDC's National Center for Chronic Disease Prevention and Health Promotion developed a conceptual framework for the literature search. They also established a process to systematically abstract published articles and to make these abstracts readily accessible to PAGAC members and consultants. The product of this effort is called the *Physical Activity Guidelines for Americans* Scientific Database (http://apps.nccd.cdc.gov/PhysicalActivityGuidelines).

Conceptual Framework

The overall conceptual framework for this project is found in Figure F.1. The scientific literature review for *Physical Activity Guidelines for Americans* was initially organized around 8 health outcome domains of interest: Cardiorespiratory Health, Metabolic Health, Mental Health, Musculoskeletal Health, Functional Health, Cancer, All-Cause Mortality, and Adverse Events. Of particular interest was the relevant scientific literature that relates 7 characteristics of physical activity (or exposures) to these health outcomes: intensity, frequency, duration, pattern, type, caloric expenditure, and volume. Also of interest — as related to these physical activity "exposures" — are physiologic states and adaptations to physical activity that may be precursors to the health outcomes listed above.

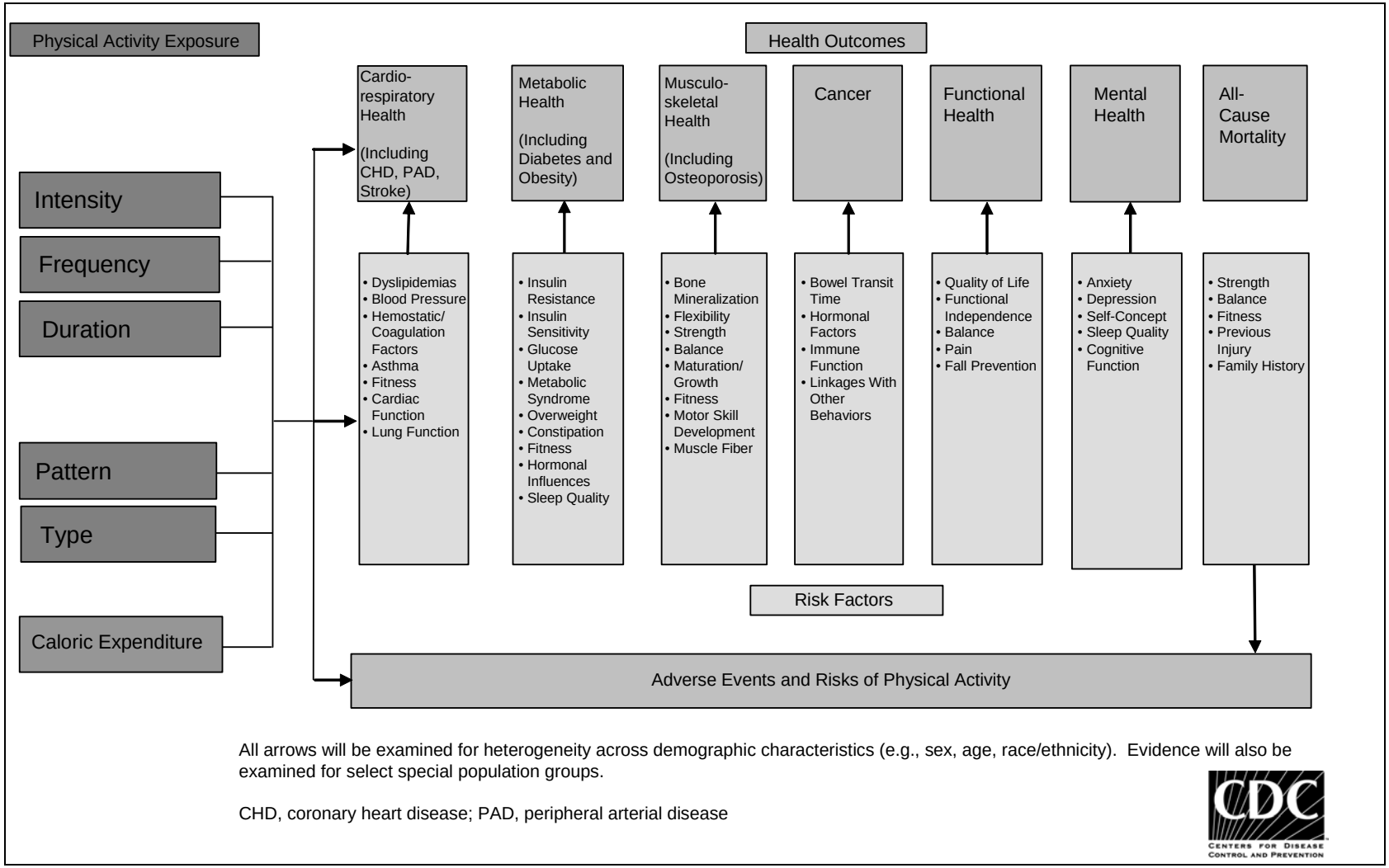
Research Questions

At least 7 key research questions were used to guide the literature review and the deliberations of the PAGAC. For each health outcome of interest:

1. Is there sufficient evidence that physical activity is associated with [Outcome]?

2. Is there sufficient evidence to support differing intensities of physical activity in relation to the association with [Outcome] or precursors?

Figure F.1. *Physical Activity Guidelines for Americans*: Conceptual Framework for Literature Review



All arrows will be examined for heterogeneity across demographic characteristics (e.g., sex, age, race/ethnicity). Evidence will also be examined for select special population groups.

CHD, coronary heart disease; PAD, peripheral arterial disease

3. Is there sufficient evidence that the accumulation of multiple short periods of physical activity is associated with [Outcome] or precursors?

4. Is there sufficient evidence of increased risk with physical activity associated with [Outcome]?

5. Is there sufficient evidence that supports a pattern of weekly regularity (days per week) of physical activity and association with [Outcome] or precursors?

6. Is there sufficient evidence that different modes (types) of physical activity are (differentially and similarly) associated with [Outcome]?

7. Is there sufficient evidence that a physical activity exposure other than 30 minutes per day on most, preferably all, days each week is associated with [Outcome]?

Operational Plan

Following from the conceptual framework, 3 CDC teams were formed to conduct the literature reviews around 3 key life stages: youth (aged 5 to 19 years), adults (aged 19 to 64 years), and older adults (aged 65 years and older). All aspects of the literature review (i.e., search strategy development and execution, review and triage of papers, cataloguing, retrieving, coding, data entry, quality control, and payment of coders) were managed by the teams. Two scientists (one senior, one junior) were appointed as co-leads for each life-stage team, and coders were assigned to the teams based on the review workload (e.g., more studies were available for adults than for youth). In addition, a separate team was formed to develop and implement quality control procedures.

Phase 1 of the literature review process (October 2006 through June 2007) was carried out by conducting systematic searches of the scientific literature on physical activity and the health outcomes described above. During this phase, the teams held weekly meetings to discuss issues that members were encountering and to devise solutions to move the project forward. Issues included literature search terms, inclusion/exclusion criteria for the literature search, study quality assessment, abstraction form and quality control, database/systems issues, abstraction progress, qualifications required of the coders, certification process and selection of coders, training sessions/agenda for abstractors, certificates developed and sent to certified abstractors, retraining issues, termination of abstractors due to production or quality control problems, development of an operations manual, preparation for the PAGAC meetings and materials, health outcome tables, timelines, team reviews, database revisions, subcommittee reviews/updates, and payment of the coders and scientific advisors.

Phase 2 of the literature review process (July 2007 through March 2008) began after the first PAGAC meeting June 28-29, 2007, and was guided by the needs of the PAGAC. During this phase, team members updated the Phase 1 literature review through June 2007 and worked with PAGAC members to obtain scientific papers that were not abstracted during

Phase 1. This process is described in Appendix F.1. (Appendix F.1 can be accessed at http://www.health.gov/paguidelines/report/.

Literature Review

Working from the literature review conceptual framework, the CDC teams performed a standardized review of the scientific literature to provide evidence for the deliberations of the PAGAC.

Searching the MEDLINE Database

The first step of the review process was to gather studies for possible inclusion in the database, using defined search strategies (Appendix F.2, which can be accessed at http://www.health.gov/paguidelines/report/). Search terms were selected for physical activity and for each identified health outcome: cardiovascular and respiratory health, metabolic health, musculoskeletal health, cancer, functional health, mental health, all-cause mortality, and injuries/adverse events.

Using the Ovid interface, the CDC teams searched the National Library of Medicine's (NLM) MEDLINE Database using only Medical Subject Headings (MeSH) major descriptors for the physical activity term set. They used a combination of MeSH descriptors and text word synonyms to search for the health outcome terms set. A listing of all MeSH headings used in the search strategies is included in Appendix F.2.

Three searches were run, and a combination of MeSH headings and text word synonyms were used to limit retrieval to 3 age groups: youth, adults, and older adults. To capture any articles not indexed by age, a fourth search was run, excluding all previous age group retrieval. A fifth search was run, combining all age groups to capture items indexed to multiple age groups. The search strategies for the 5 groups are included in Appendix F.2.

Each search was further limited by restricting retrieval to English language and to articles published after 1994 that dealt with human subjects and contained abstracts. Finally, the searches excluded 3 publication types — comments, editorials, and reviews. Search results were stored in Word files and imported into Reference Manager Database files.

Selecting the Articles

The CDC teams developed specific inclusion and exclusion criteria to determine whether studies would be eligible for abstraction. They also developed an inclusion/exclusion coding system that allowed them to classify references efficiently and accurately for the abstraction process. This process was divided into 2 phases: Certain studies of physical activity and a diagnosable health outcome were abstracted during Phase 1; other studies of physical activity and risk factors for the health outcomes were held for possible abstraction at a later date (Phase 2), if requested by the PAGAC.

Inclusion and Exclusion Criteria

Articles were considered for inclusion in the review if they met certain criteria. Similarly, articles with certain criteria were excluded from the review. Appendix F.3 provides a detailed explanation of the inclusion and exclusion criteria developed for this review. (Appendix F3 can be accessed at http://www.health.gov/paguidelines/report/.)

Abstracting the Articles

For each scientific article, abstractors recorded the following information: Overall study design; sample and participant characteristics; intervention design and duration (if an intervention study); physical activity exposure(s), including the dose of physical activity provided to participants or in which they participated; follow-up time period; health outcome(s); and the most advanced study results. For example, if a study presented an analysis adjusted for age and presented the same analysis adjusted for age and body mass index (BMI), the abstractor was instructed to record the age- and BMI-adjusted results.

Abstractors were hired, trained, and certified to perform all abstracting duties, and strict quality control procedures were used throughout the abstraction project. The quality control team checked and corrected 12.5% of abstracted papers. Abstractors were put on probationary status if they did not meet quality control standards. Cursory checks of abstractions were conducted, and subsequent corrections were made by all members of the Physical Activity Guidelines team at CDC.

A Web-based data entry system was developed to manage all abstracted studies for this project. This system was modeled after a similar system that CDC has used to abstract studies for the *Guide to Community Preventive Services*, which provides systematic reviews of community-based interventions. The physical activity Web-based data entry system includes summary tables of the scientific articles abstracted as part of the literature review for the *Physical Activity Guidelines for Americans.* The summary tables can be accessed at http://apps.nccd.cdc.gov/PhysicalActivityGuidelines.