

Appendix C

Illustrated Checklist of Design Concepts for Pedestrian and Bicycle Friendly Environments

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**By MetroWest Regional Collaborative for
“MetroWest Moves” Community Transformation Grant
Towns of Framingham, Hudson, Marlborough**

Background

Sedentary lifestyle and poor nutrition are second to tobacco in causing illness, disability, and premature death.^{1,2} Regular physical activity is associated with improved psychological well-being and reduced risk of premature death, contributes to the primary and secondary prevention of several chronic diseases (e.g., cardiovascular disease, type 2 diabetes) and reduces the risk of many adverse health outcomes (e.g., obesity, stroke),^{3,4} making it beneficial for nearly everyone.

The built environment (the physical layout and psycho-social milieu of a community) influences both recreational and transport-related physical activity. Therefore careful consideration of characteristics and strategies to create walkable/bikeable and safe communities is critical.



This checklist has been developed for Framingham, Hudson, and Marlborough to codify and institutionalize the agreed-upon best practices to encourage and support a pedestrian and bike friendly environment as articulated in Federal and State agencies or national professional associations such as the American Association of Highway and Transportation Officials (AASHTO) Pedestrian Facilities Guidebook; Massachusetts Department of Transportation (MDOT) Development and Design Guidebook; Manual of Uniform Traffic Control Devices (MUTCD); Americans with Disabilities Act Architectural Guidelines (ADAAG), Mass Architectural Access Board (AAB); and Complete Streets principals.

The Checklist is not intended as comprehensive regulations, but rather a set of design elements and techniques that boards and agencies should consider when reviewing projects and/or developing revised zoning. Although prepared for Framingham, Hudson, and Marlborough, the Checklist is general enough to be useful to all communities.



This document is divided into two parts: 1) General Development Guidelines to be considered to enhance private and public pedestrian and bicycle environments and 2) Specific Design Guidelines related to pedestrian, bicycling, transit enhancements, as well as traffic calming measures.



Section 1. General Development Guidelines



The following Development Guidelines should be considered to enhance the pedestrian and bicycle environment within the community.



Guidelines	Community Benefits	Illustration
<p><u>Encourage compact, walkable, mixed use developments</u></p> <ul style="list-style-type: none"> • Buildings close to road to shorten walking distances • Parking behind or in parking garages. • Buildings at least 2 stories high for sense of enclosure. • Multiple building entrances • Avoid blank facades • Buildings of Appropriate scale and detailing for context • Desired mix of land uses TBD 	<ul style="list-style-type: none"> • Economic benefits to local governments & home owners: Allows growth while minimizing congestion • Supports public transit efficiency • May reduce commute times • Improve air quality • Improve visual quality • Minimize pedestrian/vehicular conflicts • Reduce reliance on cars and fossil fuels • Preserves open space • Health Benefits of walking and biking • Community Social Interaction 	 <p>Mill Village, Sudbury. Photo Courtesy Randall Arendt</p>
<p><u>Require pedestrian and bicycle friendly streetscapes</u></p> <p>(Described in more detail below in sections on pedestrian and bicycle enhancements and traffic calming)</p> <ul style="list-style-type: none"> • Continuous sidewalks • Crosswalks, • Medians • Landscaping • Goal to develop “Complete Streets” ie. All users of roadway given equal importance. 	<ul style="list-style-type: none"> • Pedestrian and bicycle safety • Improved visual quality • Reduce vehicle trips and vehicle miles travelled • Improved environmental quality • Health Benefits of walking and biking 	 <p>Commonwealth Avenue, Newton Photo by CRJA</p>



<p><u>Encourage pedestrian amenities</u> <u>such as:</u></p> <ul style="list-style-type: none"> • Wider sidewalks • Outdoor seating • Courtyards • Public art • Transit shelters 	<ul style="list-style-type: none"> • Improved visual quality • Comfort and convenience • Community Social Interaction • Increased Property Values and tax revenue 	 <p>Photo Courtesy Randall Arendt</p>
<p><u>Encourage Transportation Oriented Developments (TOD)</u></p> <ul style="list-style-type: none"> • Higher density • Include mix of residential and commercial land uses and open space. • Generally, within ½ mile of public transit facilities 	<ul style="list-style-type: none"> • Minimize traffic impacts of developments • Reduce Vehicle miles travelled • Promote walking and biking to transit facilities • Economic benefits from concentrated development 	 <p>Dennison Housing , Framingham Photo by Bruce leish, MWRC</p>



<p><u>Provide or support good mass transit facilities.</u></p> <p>Options as appropriate for locale include, among others:</p> <ul style="list-style-type: none"> • Bus • Rail • Trolley • Ferry • Pedi-cab 	<ul style="list-style-type: none"> • Supports compact walkable mixed use developments • Reduces dependence on automobiles • Promotes walking to and from transit facilities • Health Benefits of walking 	 <p>Old Colony Rail Station, Brockton Photo by Bruce Leish, CRJA</p>
<p><u>Require Parcel Interconnectivity:</u></p> <ul style="list-style-type: none"> • Require adjacent commercial parcels to be connected by roadways and pathways. • Consider breaking larger mega-blocks into a smaller grid of traditional streets. 	<ul style="list-style-type: none"> • Minimizes unnecessary traffic on main roadways by providing a choice of alternate routes • Reduces concentration of traffic at entry points of large developments • Saves drivers time • Creates opportunity for buildings to be sited close to a roadway with parking behind. Parking accessed from rear connector roads. • Safer pedestrian environment which minimizes pedestrian crossings of large parking lots 	 <p>Illustration by Dover Kohl and Partners</p>

<p><u>Require Parcel Interconnectivity:</u></p> <ul style="list-style-type: none"> • Minimize cul de sacs. If necessary, require pedestrian connections between parcels and neighborhoods • Require pedestrian connections and sidewalks between commercial parcels 	<ul style="list-style-type: none"> • Safer and more direct pedestrian connections • Minimize vehicular trips 	 <p>Route 9 Southborough Photo by Alison Felix, MAPC</p>
<p><u>Require well landscaped parking lots and buffers:</u></p> <ul style="list-style-type: none"> • Shade and ornamental trees • Shrubs • Groundcover and flowers <p>As necessary and appropriate:</p> <ul style="list-style-type: none"> • Stone walls • Fencing • Raised berms (mounds) etc. 	<ul style="list-style-type: none"> • Improved visual quality • More pleasant pedestrian environment • Less distracting and safer for drivers 	 <p>Temple Street, Framingham Photo by Bruce Leish, MWRC</p>

<p><u>Encourage structured parking and place open parking behind buildings.</u></p> <ul style="list-style-type: none"> • Animate ground floor of parking garages with shops and restaurants. • Consider shared parking. • Reduce parking requirements in mixed use, walk-able areas and those well served by transit. • Consider land banking of parking where requirements seem excessive. 	<ul style="list-style-type: none"> • Improved visual quality • Provides interest and activity to reduce actual and psychological distances between buildings and uses to encourage walking • Minimizes pedestrian crossings of large parking field • More efficient use of land by minimizing land area required for parking 	 <p>Legacy Place, Dedham Photo by Bruce Leish, MWRC</p>
<p><u>Natural storm-water management</u></p> <ul style="list-style-type: none"> • (Incorporate stormwater treatment into planting areas and tree pits) • Minimize curbing • Native Landscaping 	<ul style="list-style-type: none"> • Minimize runoff and flooding • Filtration of pollutants before entering stormwater system, wetlands, and rivers. • Reduced cost of stormwater systems • Increase survival rate and health of plantings 	 <p>Photo Courtesy Randall Arendt</p>

<p><u>Maximize trail connections and visibility. Connections to:</u></p> <ul style="list-style-type: none"> • Transit stations • Shopping areas • Opens space and recreation • Schools • Public facilities. 	<ul style="list-style-type: none"> • Safer routes • Promote walking and exercise 	 <p>Milford Upper Charles Trail Photo by Bruce Leish, CRJA</p>
<p><u>Maintain historic site elements and unique or special natural site features.</u></p> <ul style="list-style-type: none"> • Historical relics • Topography • Water bodies • Wetlands • Wildlife habitat • Views 	<ul style="list-style-type: none"> • Promotes a sense of place and a connection to the past • Improved visual quality • Reuse of materials reduces energy required to manufacture new materials 	 <p>Computer Associates Conference Center, Framingham Photo by Bruce Leish, MWRC</p>

<p><u>Encourage reuse of existing buildings and sites</u></p> <ul style="list-style-type: none"> • Adaptive reuse • Infill • Building on previously developed sites 	<ul style="list-style-type: none"> • Promotes a sense of place and a connection to the past • Saves energy • Preserves existing open space 	 <p>Computer Associates Conference Center, Framingham Photo by Bruce Leish, MWRC</p>
<p><u>Well designed Commercial signage and facades:</u></p> <ul style="list-style-type: none"> • Attractive • In scale with context and architecture 	<ul style="list-style-type: none"> • Improved visual quality • Less chaotic. Calming • Economic benefits • Increased property values 	 <p>Photo Courtesy of Randall Arendt</p>

<p><u>Provide accessible, usable open space and gathering spaces</u></p> <ul style="list-style-type: none"> • Parks • Plazas • Trails • Play areas 	<ul style="list-style-type: none"> • Opportunities for socialization, relaxation, recreation and culture • Health benefits of walking 	 <p>Market Square, Portsmouth, NH Photo by CRJA</p>
<p><u>Careful Design of gas stations and other automobile- dependent uses:</u></p> <ul style="list-style-type: none"> • Avoid locating at corners • Architecture in keeping with context. • Buildings close to road, pumps preferably behind. 	<ul style="list-style-type: none"> • Improved visual quality • Pedestrian safety 	 <p>Meredith New Hampshire Photo by Bruce Leish, CRJA</p>

Attractive, adequate street lighting:

- Minimize spillover and glare
- Accent intersections and pedestrian crossings
- Design, height and spacing appropriate for context
- Good color rendition of light
- Energy efficient

- Pedestrian and vehicular safety
- Improved visual quality




Kansas City , Missouri


Photo Courtesy of Randall Arendt


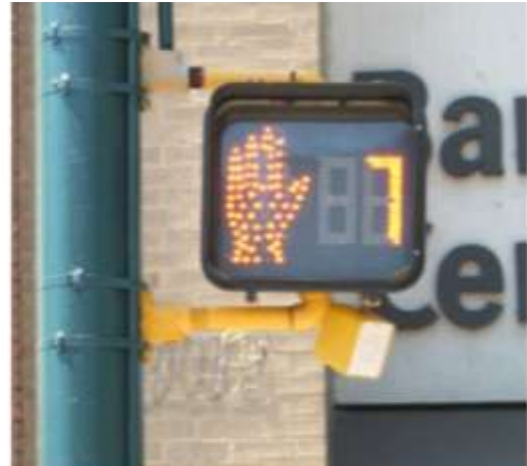
Section 2. Specific Design Guidelines



This section describes more specific design guidelines for pedestrian and bicycling enhancements in both public and private areas, as well as transit support and traffic calming measures.

Pedestrian Enhancements

Guidelines	Community Benefits	Illustration
<p><u>Sidewalks</u></p> <ul style="list-style-type: none"> • Continuous sidewalks • Paving to edge of road in more urban areas with high amounts of crossing foot traffic and/or curbside parking. Consider specialty paving or border feature strip. • ADA compliant sidewalks and paths, including curb ramps with detectable warnings and 2% maximum cross-pitch • Walkable pavements: concrete, bituminous concrete (asphalt), brick or concrete unit pavers (set on a concrete base for stability), stone. • Extend sidewalk material across driveways and curb cuts 	<ul style="list-style-type: none"> • Pedestrian safety • Improved visual quality • Accessibility for all users • Quality materials and construction provide lower long-term life-cycle costs 	 <p data-bbox="1247 1263 1675 1286">Attleboro, MA Photo by Bruce Leish, CRJA</p>

<p><u>Sidewalks (continued)</u></p> <ul style="list-style-type: none"> • Set back from curb with generous planting strip where possible, especially on high speed arterials. Possible meandering curving sidewalks. 	<ul style="list-style-type: none"> • Buffer from noise and pollutants • Safer pedestrian environment 	 <p>Home Depot, Natick Photo by Bruce Leish, CRJA</p>
<p><u>Pedestrian Crossings</u></p> <ul style="list-style-type: none"> • Curb bump outs (road neckdowns) • Crosswalks – Comfortable, frequent, highly visible (Reflective thermoplastic strips, concrete unit pavers with granite edging on concrete base with sand swept joints, stamped asphalt, stamped concrete, solid color traffic paint, reflective paints, polymers. Untreated concrete not recommended in roadway due to potential salt deterioration. 	<ul style="list-style-type: none"> • Minimize crossing distances for safety • Improved visual quality • Quality materials and construction provide lower long-term life-cycle costs 	 <p>Attleboro, MA Photo by Bruce Leish, CRJA</p>

<p>Medians</p> <ul style="list-style-type: none"> • Medians at least 6 feet wide where possible • Breaks in medians for wheelchair access • Plantings on 6' wide medians, 10 feet wide preferable for trees. • Grass or paving on narrower medians. • If sufficient width, paving at edges of islands protects plants and grass. Specialty pavers or paving treatment or cobble preferred 	<ul style="list-style-type: none"> • Provides an area of safety/refuge while crossing, particularly while crossing multiple lanes. • Improved visual quality • Quality materials and construction provide lower long-term life-cycle costs 	 <p>Memorial Square, Framingham Photo by Bruce Leish, MWRC</p> <p>Wayland, MA Photo by Bruce Leish, MWRC</p>
<p><u>Pedestrian signals/safety at crossings</u></p> <ul style="list-style-type: none"> • Pedestrian actuated signals • Audible crossing signals • Countdown clocks • Signage for motorists and /or flashing lights • Clear sight lines 	<ul style="list-style-type: none"> • Safer pedestrian environment • Accommodates visually impaired, elderly and disabled users 	 <p>Source: MAPC Boston Region Pedestrian Plan</p>

<p><u>Street furniture and amenities</u></p> <ul style="list-style-type: none"> • Benches, • Lighting – attractive and adequate, • Trash receptacles, • Mast arm signals as appropriate 	<ul style="list-style-type: none"> • Improved visual quality • More comfortable and pleasant pedestrian environment 	 <p>DeMoines, Iowa Photo by John Amodeo, CRJA</p>
<p><u>Landscaping</u></p> <ul style="list-style-type: none"> • Continuous shade trees, planters. • Smaller /ornamental trees under overhead wires or set back 10 feet from wires • Shrubs • Flowers • Maximize all season interest - color, & texture • Low maintenance plantings, tolerant of: Salt, drought, snow loading, pollutants. 	<ul style="list-style-type: none"> • Improved visual quality • More comfortable and pleasant pedestrian environment 	 <p>Walmart, Route 9, Framingham Photo By Bruce Leish, MWRC</p>

Curbing:



- Appropriate type for durability and safety
- Vertical granite in urban areas or adjacent to sidewalks
- Sloped granite (not adjacent to sidewalks)
- Bituminous cape cod berm (rural)
- Concrete curbing not recommended due to durability issues.
- Limit number of driveways and curb cuts



- Appropriate curbing choices provide safety and durability





Linden Street, Wellesley Photo by Bruce Leish, MWRC



Bicycle Enhancements : (All bicycle enhancements should conform to MUTCD and “Complete Streets Guidelines”)



Guidelines	Community Benefits	Illustration
<p><u>Continuous bike lanes or bike paths to the extent possible</u></p> <ul style="list-style-type: none"> • 10-12’ off-road path or shared path 	<ul style="list-style-type: none"> • User safety and convenience • Encourages alternative s to vehicular travel 	 <p>Natick Mall Shared Use Path Photo by Bruce Leish, MWRC</p>
<p><u>Bike lanes of ample width</u></p> <ul style="list-style-type: none"> • 4’ on-road bike lanes each direction 	<ul style="list-style-type: none"> • User safety and convenience • Encourages alternative s to vehicular travel • Environmental benefits • Health benefits 	 <p>Rochester, NY Visualization by CRJA</p>

<p>Proper pavement marking symbols and lane markings such as:</p> <ul style="list-style-type: none"> • “Bike box” at intersections • Bicycle symbol at like lanes 	<ul style="list-style-type: none"> • Increased safety for cyclists • Clearer direction for motorists and cyclists 	 <p>Portland, Oregon Bike Box Photo Public Domain</p>
<p>Cycle tracks</p> <ul style="list-style-type: none"> • Where possible, provide separate off-road lanes for bicycles and pedestrians • Clearly define lane with markings, and color 	<ul style="list-style-type: none"> • Minimize vehicular bicycle conflicts • Increased safety for cyclists • Clearer direction for motorists and cyclists 	 <p>Vassar Street, Cambridge Photo by CRJA</p>

<p><u>Bike racks</u></p> <ul style="list-style-type: none"> • Conveniently located • Attractive • Durable – Galvanized unpainted most chip resistant. • Secure • Highly visible locations 	<ul style="list-style-type: none"> • Encourages use of bicycles as alternative to driving • Reduces congestion • Health benefits of cycling 	 <p>Old Colony Commuter Rail Station, S. Weymouth. Photo by Bruce Leish, CRJA</p>
<p><u>Signage</u></p> <ul style="list-style-type: none"> • Appropriate warning signs for motorists such as “Share the Road”, “Bicycle Path Ahead” etc. • Comply with MUTCD signage requirements 	<ul style="list-style-type: none"> • Increases safety for cyclists • Provides clear warnings for motorists 	 <p>R3-17</p> <p>Source: MUTCD</p>

Transit Issues (Amenities for pedestrians and bicyclists in support of transit)

Guidelines	Community Benefits	Illustration
<p><u>Well located bus pull offs with shelters</u></p>	<ul style="list-style-type: none"> • Provides safe, visible and comfortable waiting area. • Potential to reduce vehicular reliance • Environmental benefits • Health benefits of walking to bus. 	 <p>Source: National Complete Streets Coalition</p>
<p><u>Dedicated transit lanes or Bus/bike shared lanes</u></p>	<ul style="list-style-type: none"> • Improves speed, safety and reliability of bus system. 	 <p>Photo Source: CNU</p>

<p><u>Clear and attractive signage</u></p>	<ul style="list-style-type: none"> • Encourage use of transit • Increases ease of use and system efficiency 	 <p>MBTA Revere Beach Blue Line Station Photo by Bruce Leish, CRJA</p>
<p><u>Curb ramps and other accessibility compliance at bus lanes and stalls.</u></p>	<ul style="list-style-type: none"> • Provides transit access to all users 	 <p>Brockton Intermodal Station Photo by Jerry Howard for CRJA</p>

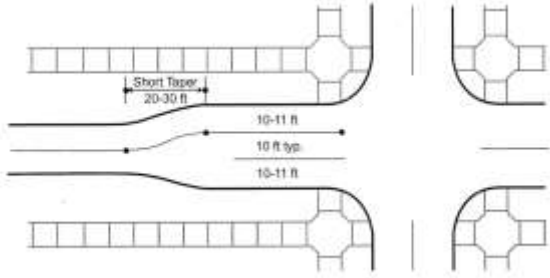

Clearly Marked Crossings at bus/transit stops

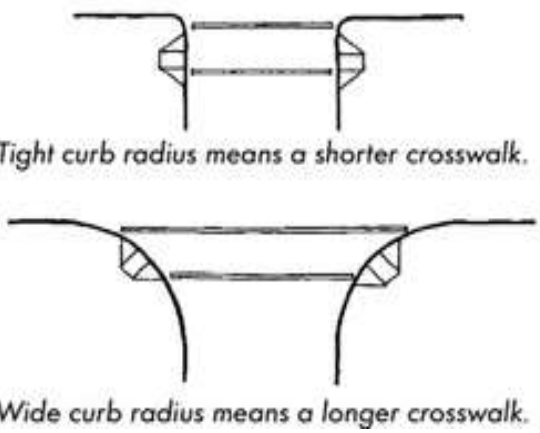

- Provides safe access to bus stops





Shoppers World, Framingham Photo by Bruce Leish, MWRC

Traffic Calming Issues (To improve the pedestrian and bicycle environment, both private and public)

Guidelines	Community Benefits	Illustration
<p><u>Narrower Streets and Travel Lanes</u></p> <ul style="list-style-type: none"> Lanes as narrow as 10 feet wide are acceptable per the MHD Design Guide 	<ul style="list-style-type: none"> Reduces Speeds Provides more room for medians, wider sidewalks, bike lanes and planting strips. 	 <p>The illustration shows two sets of street cross-section diagrams. The top set shows a street with a 'Short Taper' of 20-30 ft, with lane widths of 10-11 ft and a 10 ft typ. median. The bottom set shows a similar street with a wider taper. The diagrams illustrate how narrower lanes and wider medians/sidewalks contribute to traffic calming.</p> <p>Source: MHD Design Guide</p>
<p><u>Reduce number of lanes</u></p>	<ul style="list-style-type: none"> Reduces Speeds Provides more room for medians, wider sidewalks, bike lanes and planting strips. 	 <p>The photograph shows a street with a reduced number of lanes, featuring a wide median and sidewalks, illustrating the concept of traffic calming through lane reduction.</p> <p>Source: National Complete Streets Coalition</p>

<p><u>Tighten curb radii</u></p>	<ul style="list-style-type: none"> • Slows automobile turning movements • Shorter crossing distances • Safer pedestrian road and driveway crossings 	 <p><i>Tight curb radius means a shorter crosswalk.</i></p> <p><i>Wide curb radius means a longer crosswalk.</i></p> <p>Source: MAPC Boston Region Pedestrian Plan</p>
<p><u>Highly visible Crosswalks (see also above)</u></p>	<ul style="list-style-type: none"> • Improves safety of pedestrians in crosswalk 	 <p>Framingham Centre Photo by Bruce Leish, MWRC</p>

<p>Roundabouts</p> <ul style="list-style-type: none"> • Modern roundabouts manage traffic without streetlights. 	<ul style="list-style-type: none"> • Accommodates more traffic with fewer or narrower lanes • Improves efficiency • Reduced number and severity of accidents. 	
<p>Curb Neckdowns (Bulb-outs)</p> <ul style="list-style-type: none"> • Extend curbing to decrease crossing distance. • Use with parallel parking 	<ul style="list-style-type: none"> • Decreases crossing time and distance for safer pedestrian environment • Defines parallel parking zones 	 <p>Source: National Complete Streets Coalition</p>

Speed Tables

- Raises crossing or entire intersection flush with curb.
- Provide gradually sloped sides, well marked to alert drivers

- Slows Traffic at pedestrian crossings and intersections
- Provides accessible crossings without need for ramps
- Enhance pedestrian safety

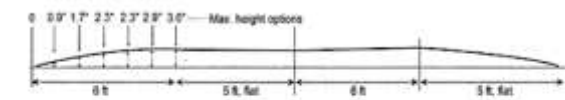


Source www.bikexpt.com



Source www.bikexpt.com

B. 22 Foot Parabolic Ramp Speed Table



C. 22 Foot Straight Ramp Speed Table



Source: MHD Design Guide

On-street parallel or angle parking where appropriate



- Provides physical buffer between pedestrians and traffic
- Enhances safety and reduces perceived road noise
- Provides additional parking convenient to destination





Photo Courtesy of Randall Arendt



Source: National Complete Streets Coalition

<p><u>Create tree lined streets or boulevards with Tree Planting strips or Tree Grates</u></p>	<ul style="list-style-type: none"> • Improved visual quality and comfort • Sets pedestrian back from edge of road for improved safety. 	 <p>Liberty Mutual, Boston Photo by CRJA</p>
<p><u>Visual cues tell motorists to slow down</u></p> <ul style="list-style-type: none"> • Lighting, street furniture, tree planting strips, planted medians, buildings close to road, highly visible crosswalks, etc. 	<ul style="list-style-type: none"> • Improves vehicular and pedestrian safety • Creates a sense of place 	 <p>Fayville Village: Visualization from Rt9 MW Smart Growth Plan</p>

<p><u>Service Roads where possible and appropriate</u></p>	<ul style="list-style-type: none"> • Separates local from through traffic • Minimizes bottlenecks • Reduces number of turning movements from main road • Provides additional medians for refuge • Provides area for buses and bicycles • Enhances pedestrian, bicycle and vehicular safety 	 <p>Chestnut Hill, MA Photo by Bruce Leish, MWRC</p>
<p><u>Eliminate free-flow right where possible</u></p> <p><u>Reduce speed limits</u></p>	<ul style="list-style-type: none"> • Improve Pedestrian and bicycle safety 	 <p>R10-11</p>

1. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Actual causes of death in the United States, 2000. JAMA : the Journal of the American Medical Association 2004;291:1238-45.
2. Mokdad AH, Marks JS, Stroup DF, Gerberding JL. Correction: actual causes of death in the United States, 2000. JAMA : the journal of the American Medical Association 2005;293:293-4.
3. United States Dept of Health and Human Services. Physical Activity and Health: A Report of the Surgeon General. In: U.S.Dept of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, eds.; 1996.
4. U.S. Department of Health and Human Services. Physical Activity Guidelines Advisory Committee Report, 2008. Hyattsville, MD: U.S. Department of Health and Human Services; 2008. <http://www.health.gov/paguidelines>; 2008.