Discussion paper

Protecting our communities: how can we increase shade in NSW public playgrounds?

A discussion paper prepared by the Sax Institute for the Cancer Institute NSW and Cancer Council NSW — March 2023

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Protecting our communities: How can we increase shade in NSW public playgrounds? Discussion paper

This discussion paper is intended to provide workshop participants with a summary of the evidence on strategies to increase shade in NSW public playgrounds and provide a basis for discussion. Prepared by the Sax Institute for the Cancer Institute NSW and the Cancer Council NSW. March 2023.

This report was prepared by Nick Petrunoff, Amanda Dominello and Sian Rudge from the Sax Institute with input from Nikki Woolley from the Cancer Institute NSW and from Ally Hamer and Elizabeth King from Cancer Council NSW.

Contents

Purpose and Background

The **purpose of this paper** is to inform discussions at a workshop on 30 March 2023 on strategies to increase shade in public playgrounds in NSW.

The workshop will draw on the experience and expertise of participants to better understand:

- Opportunities to increase shade across NSW playgrounds
- Barriers to achieving change
- Insights regarding the most strategic approaches to implementing shade to better protect NSW communities from the sun and reduce their risk of skin cancer.

This discussion paper provides workshop participants with background on the evidence for strategies that have been used to increase shade. These strategies can **increase both quality natural shade**[1, 2] (e.g. the right species of trees positioned well) **and quality built shade** [3, 4] (e.g. shade sails which meet design specifications positioned for maximum shade). During the workshop we will seek participants' input into developing a set of prioritised real-world actions. It is certain that a combination of actions will be required to increase UV-protective shade in NSW playgrounds over

> Ultraviolet (UV) radiation levels in NSW are high enough to damage unprotected skin at least 10 months of the year, and children are particularly susceptible to harms from UV radiation. Yet 19% of surveyed NSW public playgrounds have no built or natural shade and **almost 58% of surveyed NSW playgrounds had low (1-25%) or zero total shade** on the longest summer day.

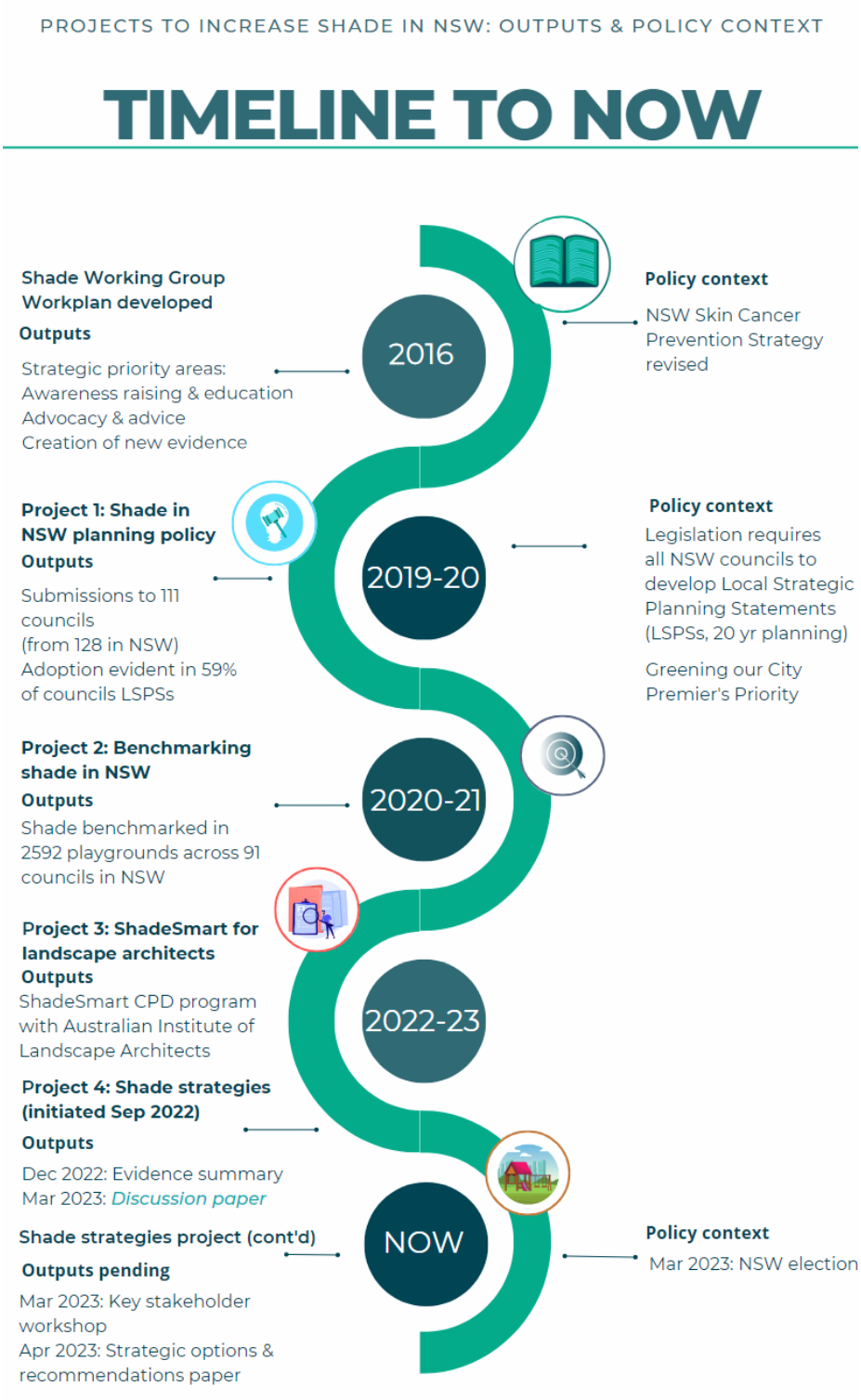
The Cancer Institute NSW and the Cancer Council NSW have partnered with the Sax Institute to explore strategies on what works to increase shade in NSW public playgrounds.

The overarching **aim** of this project is to develop a prioritised plan of work to improve ultra-violet radiation (UV) protective shade in NSW playgrounds that is acceptable, effective and amenable to the community, government and industry. The project has involved a Shade Strategies evidence review which brings together the national and international evidence for strategies to increase shade in public playgrounds. The next component of this work is the workshop, followed by a Strategic Options and Recommendations paper summarising workshop discussion.

The workshop builds on work from across sectors to increase shade in public spaces (see Appendix 1 for a description and timeline). This project focuses on public playgrounds because they are important spaces where children, caregivers and the wider community gather, and increasing shade in these priority spaces is likely to be feasible and implementable. In addition, any impacts will be measurable over time as the Cancer Institute NSW commissioned the Queensland University of Technology to benchmark the amount of shade in NSW playgrounds - see Appendix 1 for details of the Benchmarking Shade in NSW Playgrounds project [1].

Image 1 provides a summary of four related projects that have preceded the Shade Strategies workshop. Appendix 1 provides a one-page elaboration on these.

Image 1 — Projects to increase shade in NSW: outputs and policy context



Part 1: The case – Why we need to increase shade in NSW public playgrounds

Skin cancer in Australia and sun protection from shade

Australia has one of the highest skin cancer incidences globally [5]. Quality shade, which is a well-designed and correctly positioned combination of natural and built shade [6] can reduce solar UV exposure by up to 75% [7].

Image 2

Shade in NSW playgrounds

Children, with their carers and the broader community, gather in playgrounds. Existing shade in playgrounds in NSW was benchmarked in 2020-2021 [1]; this demonstrated a clear need for improvements to be made. As highlighted in Table 1, approximately 58% of NSW playgrounds had low or zero total shade when measured at summer solstice. Across NSW, built shade existed in 19% of playgrounds. And while 75% of playgrounds had some tree shade, 58% of these had tree shade which covered up to one quarter of the playground area only.

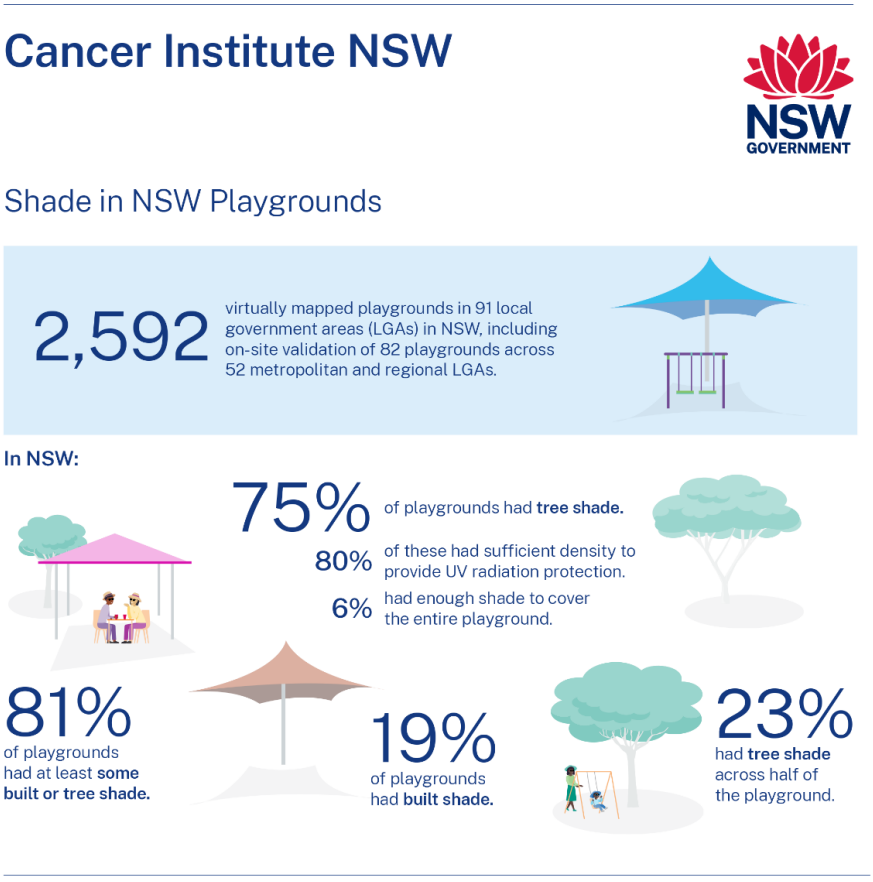
Table 1— Percentage of playgrounds across NSW within total shade density categories

Shade density category	Winter solstice* %	Summer solstice*%
Zero shade (<1%)	11.75	**7.25**
Low shade (1-25%)	59.25	**50.50**
Low to Moderate Shade (>25%-50%)	25.75	28.75
Moderate to high shade	3.00	11.50
High shade	0.25	2.00

***Summer solstice** is the date when the sun reaches its maximum declination, marked by the longest day. Taken as mid-day in this study[1].

Public playgrounds are usually situated within local government areas. The graphic below is an example [8] of how the data from the Benchmarking Shade in NSW Playgrounds project has been presented in follow-up communication with 54 NSW local government areas (or councils) [9].

Image 3 — Example of shade benchmarking results in NSW



The Benchmarking Shade in NSW Playgrounds project also found that the quantity and quality of shade provided in NSW council playgrounds was variable and that a key contributor to this was varying requirements for shade and best practice shade strategies in local government area guidelines and policies. Further, the Shade Strategies evidence review [10] found only six examples of clear targets for shade in playgrounds globally (Table 2, Appendix 2). The lack of clear targets may relate to the complexity of designing shade for specific sites. Part 2 of this discussion paper summarises strategies in addition to targets for increasing shade.

The Benchmarking Shade in NSW Playgrounds project included focus groups with a diverse mix of participants including: community members, industry design, planning and built environment professionals; shade manufacturers; council participants across differing LGAs; social impact strategists; and community advocates, provided many insights that were grouped into 24 thematic clusters. Community members indicated a desire for heightened quantity and quality of shade in community playgrounds, to decrease heat in the playground, increase usability of the playground equipment and increase UV protection.

Further focus groups with Non community member stakeholders favoured a more conservative increase to shade than the community members.

Part 2: Strategies and key considerations

Strategies for increasing shade

The Shade Strategies evidence review addressed five questions:

1. What is the evidence on shade targets or other metrics for playgrounds internationally?
2. What strategies have been used to increase shade in playgrounds?
3. What is the evidence on co-benefits of increased shade in playgrounds?
4. What barriers and enablers have been described in the implementation of strategies identified in questions 2 and 3?
5. Amongst all the key source documents and additional documents, what are the gaps in the information required to inform strategies that can increase shade in playgrounds?

What strategies were identified?

Fifty-nine documents (31 peer reviewed and 28 grey literature) were reviewed. Image 4 shows six types of strategies to create shade:

- Targets and other metrics
- Policies, guidelines and recommendations
- Settings-based site audits and site plans
- City-level tree and shade site masterplan
- Monetary incentives
- Multi-component interventions.

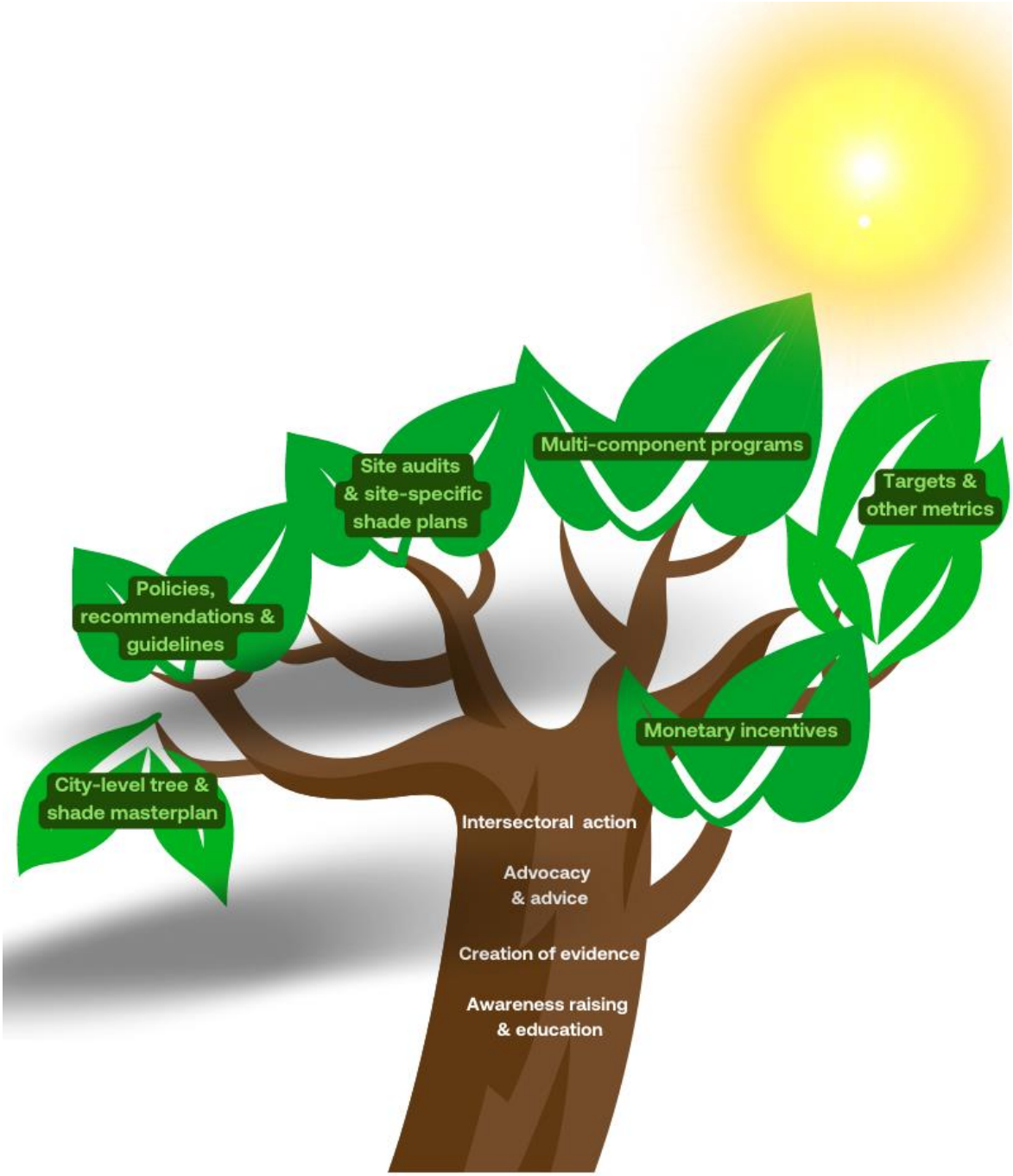
These often included four activities which underpinned them:

- Intersectoral action
- Advocacy and advice
- Creation of new evidence
- Awareness raising and education.

The review found twenty-five examples of strategies that were used to increase shade in playgrounds, with a brief description of what they achieved and why (summarised in Appendix 2). This list of strategies identified in the review is not exhaustive, and we expect that workshop attendees will identify more examples. The set of inclusion criteria for these strategies is described in the full report for the evidence review, and we also only included those where there was some description of their implementation and/or reporting of outcomes so that readers could understand not only what strategies worked, but under what circumstances and why. Further information, including details of the implementation on these strategies can be found in the Shade Strategies evidence review report [10].

Overall, we found that due to the complexity of designing and building effective shade, policies and guidelines often included technical guidance sections. Site audits to develop shade was one approach for addressing this complexity. Comprehensive strategies such as multi-component programs and policies or guidelines with accompanying technical guidance had long timelines.

Image 4 — Tree of six types of strategies to increase shade with four ongoing activities underpinning them



Targets have been proposed as one way to increase shade in public spaces, Box 1 summarises the main findings related to targets from the evidence review.

Box 1 —Summary of evidence on shade targets.

Shade targets for playgrounds We found six examples of targets and other metrics for playground shade in the grey literature (Table 2). Although Phoenix's 'vision' for city-level tree canopy cover was not specifically about playground shade it was considered since it described what they achieved.

Where have targets been implemented? The review identified shade targets for playgrounds from NSW and Queensland implemented at local council level following state level guidance.

What are they? Examples distinguished between the non-play areas surrounding playgrounds which had targets of >40% shade and the play areas, with targets of 50%-100%.

What wording was used? 'Minimum' targets, +/- 'essential and preferred criteria'.

Is there evidence of acceptability? Focus groups with industry and local government in NSW indicated that having defined shade target/s would enable councils to enact advancement of shade in playgrounds. They preferred shade target percentages of 40% to 60% coverage (with 100% not preferred). Community members preferred greater shade coverage.

Who adopts them? In Australia, local councils. A study assessing the response of planning and transport professionals to public health guidance on the built environment and physical activity found competition with other guidance documents may threaten adoption.

What is known about the success of targets achieving their aims? Evaluations of real-world strategy implementation identified in the review did not describe impacts on shade. However, the ongoing advocacy and engagement efforts of Cancer Institute NSW and Cancer Council NSW with NSW local councils is beginning to result in adoption of shade targets [9, 11].

Applicability and recommendations

Evidence for what works when creating shade

Whilst the Shade Strategies evidence review did identify strategies to create shade in playgrounds and other public spaces, the evidence regarding what they achieved mostly related to implementation rather than shade increases and protection from UV in playgrounds (see Table 2, Appendix 2). Although it was not related to shade in playgrounds specifically, in relation to multi-strategic programs which include environmental interventions (e.g., to increase shade in schools) a paper [12] stated that in Victoria:

> *'.. several studies have tracked policy development and practices in diverse settings. These have demonstrated the potential for environmental interventions to reduce exposure to ultraviolet radiation...health economic analyses show it [i.e., skin cancer prevention] is an excellent investment, and there is ... evidence of longer-term effects on incidence in younger cohorts [12]'.'*

The **key success factors** on why strategies achieved what they did differed in each situation and are summarised in the final column of Appendix 2 and described in more detail in the full evidence review report [10]. These findings from the review are reflected in this quote from Kapelos and colleagues [13]:

> *'There is a need for a **dynamic approach** to problem solving that is responsive to new evidence and situations. The **deliberate work** of the Toronto Cancer Prevention Coalition since 1998 to effect a shade policy is an example of a **successful collaboration among individuals from different disciplines to develop multiple strategies to address shade**. The work of this group is characterized by **perseverance**, the capacity to take on a multitude of approaches, and the **agility to change course to accommodate changing political exigencies**. Interventions must be matched with needs and capabilities. What is good for Toronto may not necessarily be good elsewhere [13].'*

In many cases the details of strategy development and implementation indicated there were **long time periods of sustained actions** that led to implementation of these strategies.

There are parallels between the Toronto experience and the experience in NSW: there is a UV Working Group in Toronto and an established Shade Working Group in NSW which has delivered sustained work integrating shade provision into the healthy built environment agenda. Similarly, **perseverance and intersectoral action** has been demonstrated in NSW when a member of the Shade Working Group, who was an active member of the peak body for landscape architects in NSW, championed the ShadeSmart work with the landscape architect peak body in NSW to create modules for shade design in their accredited training (see Appendix 1 for more detail). Further, when all 128 local governments in NSW were required to develop long-term Local Strategic Planning Statements (LSPSs), they demonstrated **agility responding to the political landscape** to create the Shade and UV inclusion in NSW local government planning policy project. As part of the UV inclusion project, the

Cancer Institute NSW engaged a Registered Planner with shade expertise to undertake a project to promote the inclusion of shade to reduce UV radiation overexposure in their LSPS documents [9] (see Appendix 1 for more detail).The Cancer Council NSW also made a total of 132 submissions to 109 local councils during 2019 and 2020 regarding the development of their LSPSs.

The Shade Strategies evidence review also identified three experiments which used strong study designs to assess the effects of interventions which involved creating shade on key outcomes. Considering evidence hierarchies of study-designs [14], **the review found high level evidence** from two randomised-controlled trials (RCTs) [3, 15] and one natural experiment [16], **which demonstrated that building shade in playgrounds and parks decreased harmful UV exposure**, **increased shade use and increased park and playground use**. Appendix 3 summarises these studies.

Key considerations for strategies to increase shade

Solution multipliers – the co-benefits of integrating shade with other policy agendas

What is the evidence on co-benefits of increased shade in playgrounds?

Creating natural shade by planting trees and/or building shade can provide health, environmental and socio-economic benefits [17]. Expert opinion from reviews suggests that shade provision for skin cancer prevention should be integrated with other policies. Adopting a co-benefits approach in one area (e.g. climate change) can provide multiple benefits from a single policy or program [13]. To inform future work, the Benchmarking Shade in NSW Playgrounds report [1] summarised how shade is being considered in relation to: mitigating the urban heat island effect; within the built environment and physical activity plus the broader city planning and population health agendas; and where shade may be integrated with other metrics/indicators, for example, the current imperative to increase tree canopy cover in NSW.

High level summary of recent evidence on co-benefits of increased shade in playgrounds

Whilst the rationale for co-benefits of shade in playgrounds to health and other outcomes is logical, there is a small volume of scientific evidence to support it. Considering levels of scientific evidence[14], the top level is systematic reviews and meta-analyses. For the focussed topic of co-benefits of increased shade in playgrounds, no such reviews were identified in our search. However, expert opinion in a critical review [13] noted:

> *'The choice to focus on shade as a specific policy issue has its limitations. While success has been achieved in Toronto with regard to the specifics of shade, shade provision for skin cancer prevention is best affected through integration with other policies. Because the intent of shade policy is so specialised, it does not capture the collective imagination as much as issues of pressing concern, such as environmental sustainability and climate change. Perhaps shade would gain more traction if it were married to these larger issues and presented as a value-added.'*

Has the evidence on co-benefits been used in strategies to increase shade?

Some examples are emerging. It is promising that shade is now considered in a large global study of urban environments and physical activity amongst adolescents [18].

Which co-benefits are gaining most traction for increasing shade?

A common theme from evidence reviewed in relation to co-benefits was the obvious link between tree shade and mitigating climate change. Since this is probably the most important issue of our time for the health of humans and our planet, any integration with goals to contribute to mitigating climate change may gain traction [19]. There are clear policy pathways that link shade to the sustainability agenda globally, nationally and locally. However, making shade for UV protection an element within these policies is the challenge.

Barriers, enablers and gaps

What barriers and enablers have been described in the implementation of strategies?

From the literature synthesised to address questions 2 and 3 of the evidence review, we identified 10 categories of barriers and enablers (Box 2): five enablers; five barriers; and one barrier/enabler category. There were more references to enablers than barriers in the literature and Box 2 presents both in order of the volume of references to that barrier or enabler (see the full evidence review report for more details) [10].

Box 2 —Enablers and barriers to implementing shade in public playgrounds from the evidence review

Enablers

Scientific evidence
Building on other metrics/measures
Policies and frameworks
Public and other support
Equity considerations

Enabler/barrier – Relevant stakeholders to engage

Barriers

The paper mountain - competition with other policies and guidance documents
Varying and often vague description of requirements
Diversity of playground types
Cost
One-off's – disbanding of the Design and Place SEPP in NSW, other demands for public health input (e.g., emergence of infectious diseases diverting resources)

Amongst all the key source documents, what are the gaps in the information required to inform strategies that can increase shade in playgrounds in NSW?

The most notable gap is evidence of strategies leading to increased shade. It was also noted under Question 3 that information of integrating shade into other planning agendas to achieve co-benefits is lacking. The article by King and colleagues [20] provided some important information to fill this gap, and more of this description of practice and its evaluation (whether in published or in the grey literature) is necessary. A road map of potential policies that the 'shade for UV protection agenda' can be integrated with would also be useful.

Part 3: Possible next steps

Public playgrounds and their surrounds are important spaces where children, caregivers and the wider community gather. The summary of recent benchmarking of shade across NSW playgrounds (1) presented in Part 1 clearly shows there is room to increase shade in public playgrounds, since 19% of playgrounds have no built or natural shade and 58% of playgrounds have low (<25%) or zero shade. Work to increase shade in playgrounds in NSW may be a steppingstone for work in other public spaces, as was the case in Toronto where pilot studies in playgrounds and waterparks was the key factor that led to adoption of guidelines for shade by the City in 2010 [13, 21].

It is intended that this discussion paper will provide workshop participants with background on the evidence for strategies that have been used to increase shade. During the workshop we will seek the input of inter-disciplinary participants to discuss: the advantages and disadvantages of different approaches to increase shade in playgrounds; the capacity and skills of individuals and organisations to effect change; and the political landscape, and identify a set of prioritised real-world actions. It is certain that a combination of strategies and actions will be required to increase UV-protective shade in NSW playgrounds over time [12].

Based on findings from the evidence review which informed this discussion paper, a list of examples for possible actions to increase shade in public playgrounds in NSW are presented below. This list is not exhaustive; it is intended to stimulate ideas for actions. Stakeholder input, via the workshop and otherwise, will be gathered before finalising an action plan on strategic approaches to implementation.

1. Generate evidence
2. Contact key groups involved in shade implementation and research nationally and globally
3. Consider documenting the evidence-informed rationale for shade targets
4. Explore integrating shade within other policies and metrics
5. Weigh-up the best tools and approaches for action

1. Generate evidence on outcomes from increasing shade in playgrounds and costs associated with different approaches

Contribute to generating new evidence on the outcome of increased shade in playgrounds. Through the multi-disciplinary networks that the Shade Working Group has already established and the strategic recommendations identified through the Shade Strategies Workshop, new demonstration projects and research priorities.

In the short-term, evidence could be generated by monitoring and evaluating the new shade projects that arise in local government areas to demonstrate the practical application of shade design, as was recommended in the report, Shade and UV inclusion in NSW local government planning policy [9]. In the medium to long-term, a follow-up study to the Benchmarking Shade in NSW Playgrounds project

[1] could be conducted to measure changes and potential improvements regarding the impact of shade strategies on shade accessibility in playgrounds at the state level.

2. Contact key groups involved in shade implementation and research nationally and globally

Contact/re-connect with key research groups and policymakers identified in the evidence review to see if they have any unpublished information. Contact:

a. Those supporting Phoenix's Tree & Shade Masterplan for information of impacts [22].
b. The North American group of authors listed in the study by Olsen and colleagues [23].
c. Groups from Melbourne and Denver who were involved in the RCT measuring effects of built shade in public parks in both cities [15], and the Melbourne shade sails experiment [16].
d. The Queensland University of Technology group who conducted the shade benchmarking research [1].
e. The Western Sydney University group who conducted research on climate-smart playgrounds [24, 25].
f. The groups involved in some of the multicomponent programs, for example Victoria and Toronto, to gather information on the development and implementation of their strategies, outcomes achieved and costs.

3. Consider documenting the rationale for shade targets using research identified in the evidence review

g. If a shade target/s is to be recommended, information on the rationale and supportive evidence should be documented. The evidence review identified information that could inform how targets or other metrics for shade could be developed, such as:

  – Observational epidemiology on shade use [26, 27].
  – Technical information and guidance on built and natural shade design[1-4, 13, 22, 23].
  – A summary of relevant built environment metrics which was intended to guide future efforts in developing shade targets (see Table 4 in[1]).
  – Playground heat mitigation metrics [1, 23-25].

4. Explore integrating shade within other policies and metrics

h. Building shade into other metrics could be explored as an enabler to creating shade in playgrounds. For example, since public parks are also usually incorporated in Liveable Neighbourhood guidelines metrics [28], playground and total shade within them could also be advocated for in such guidelines.

i. Map the policy paths and the priority stakeholders that can advocate for the integration of shade in policies related to achieving sustainable development goals. This path may include more immediate links to tree canopy targets and mitigating the urban heat island effect.

5. Weigh-up the best tools and approaches for action

j. Gain stakeholder feedback on a comparison of more generic guidance documents and audit tools such as the Cancer Council's Guidelines to shade [6] and the Queensland Creating Shade at Public Facilities [29] to highly technical setting and site-specific guidance like the Toronto shade guidelines [21] and the Government Architects NSW Greener Places draft design guidelines [30]. Holman and colleagues' summary of common steps in site-audits as well as their table summarising available audit tools up to 2017 should also be considered [4].
k. Based on the evidence review, an evidence-informed argument for creating shade in playgrounds can be created for use in ongoing advocacy, advice and education efforts.

References

1. Briant S, et al., *Benchmarking Shade in NSW Playgrounds: Full Final Research Report (For the Cancer Institute NSW)*. 2021, Queensland University of Technology: Queensland. p. 133.
2. Sivarajah, S., S.C. Thomas, and S.M. Smith, *Evaluating the ultraviolet protection factors of urban broadleaf and conifer trees in public spaces.* Urban Forestry & Urban Greening, 2020. **51**: p. 126679 DOI: https://doi.org/10.1016/j.ufug.2020.126679.
3. Dobbinson, S.J., et al., *Solar UV Measured under Built-Shade in Public Parks: Findings from a Randomized Trial in Denver and Melbourne.* International Journal of Environmental Research and Public Health, 2022. **19**(17): p. 10583 DOI: https://doi.org/10.3390/ijerph191710583.
4. Holman, D.M., et al., *Shade as an Environmental Design Tool for Skin Cancer Prevention.* Am J Public Health, 2018. **108**(12): p. 1607-1612 DOI: 10.2105/ajph.2018.304700.
5. Bray, F., et al., *Global cancer statistics 2018: GLOBOCAN estimates of incidence and mortality worldwide for 36 cancers in 185 countries.* CA: a cancer journal for clinicians, 2018. **68**(6): p. 394-424 DOI: https://doi.org/10.3322/caac.21492.
6. Cancer Council NSW. *Guidelines to shade*. 2013; Available from: https://www.cancercouncil.com.au/wp-content/uploads/2011/04/Guidelines_to_shade_WEB2.pdf.
7. Parsons, P.G., et al., *The shady side of solar protection.* Medical journal of Australia, 1998. **168**(7): p. 327-330 DOI: https://doi.org/10.5694/j.1326-5377.1998.tb138960.x.
8. Cancer Institute NSW. *Shade in Northern Beaches Playgrounds: Local Government Benchmarking summary*. 2022.
9. Cancer Institute NSW. *Shade and UV inclusion in NSW local government planning policy.* 2022; 142]. Available from: Available from https://www.cancer.nsw.gov.au/about-cancer/document-library/shade-and-uv-inclusion-in-nsw-local-government-pla
10. Petrunoff N, et al., *Strategies to increase shade in public playgrounds: A realist review*. 2022, The Sax Instute: Sydney. p. 49.
11. Cancer Institute NSW. *Breifing Paper for Wagga Wagga Councillor Workshop: Shade Sails Over Playgrounds*. 2022: NSW.
12. Hill, D., S. Dobbinson, and J. Makin, *Interventions to lower ultraviolet radiation exposure: Education, legislation and public policy.* ASCO 2009 Education Book, Melanomas/Skin Cancer, 2009: p. 526-531.
13. Kapelos, G.T. and M.R.S. Patterson, *HEALTH, PLANNING, DESIGN, AND SHADE: A CRITICAL REVIEW.* Journal of Architectural and Planning Research, 2014. **31**(2): p. 91-111 DOI: https://www.jstor.org/stable/43031028.
14. Merlin, T., A. Weston, and R. Tooher, *Extending an evidence hierarchy to include topics other than treatment: revising the Australian 'levels of evidence'.* BMC Medical Research Methodology, 2009. **9**(1): p. 34 DOI: 10.1186/1471-2288-9-34.
15. Buller, D.B., et al., *Shade Sails and Passive Recreation in Public Parks of Melbourne and Denver: A Randomized Intervention.* American Journal of Public Health, 2017. **107**(12): p. 1869-1875.
16. Dobbinson, S.J., et al., *Examining Health-Related Effects of Refurbishment to Parks in a Lower Socioeconomic Area: The ShadePlus Natural Experiment.* International Journal of Environmental Research & Public Health [Electronic Resource], 2020. **17**(17): p. 21.
17. Cancer Council NSW and Cancer Institute NSW. *Co-benefits of shade fact sheet*. 2019; Available from: Availabe from https://www.cancercouncil.com.au/wp-content/uploads/2020/08/Shade-a-planning-and-design-priority.pdf.
18. Cain, K.L., et al., *International Physical Activity and Built Environment Study of adolescents: IPEN Adolescent design, protocol and measures.* BMJ open, 2021. **11**(1): p. e046636.

19. Thompson, S. and A. Capon, *The co-benefits framework for understanding and action on climate change*, in *The Routledge Handbook of Planning for Health and Well-Being*. 2015, Routledge. p. 353-366.
20. King, E., S. Thompson, and N. Groskops, *Integrating shade provision into the healthy built environment agenda: the approach taken in NSW, Australia.* Public Health Research & Practice, 2022. **32**(1) DOI: https://doi.org/10.17061/phrp3212206.
21. Toronto Cancer Prevention Coalition. *Shade Guidlines*. 2010: Toronto.
22. City, of, and Phoenix. *Parks and Recreation. Tree & Shade Master Plan 2010.* . 2010 Nov 8, 2022]; Available from: https://www.phoenix.gov/parks/parks/urban-forest/tree-and-shade.
23. Olsen, H., E. Kennedy, and J. Vanos, *Shade provision in public playgrounds for thermal safety and sun protection: A case study across 100 play spaces in the United States.* Landscape and Urban Planning, 2019. **189**: p. 200-211 DOI: 10.1016/j.landurbplan.2019.04.003.
24. Pfautsch, S. and A. Wujeska-Klause, *Guide to Climate-Smart Playgrounds: Research Findings and Application.* 2021.
25. Pfautsch, S., A. Wujeska-Klause, and J. Walters, *Outdoor playgrounds and climate change: Importance of surface materials and shade to extend play time and prevent burn injuries.* Building and Environment, 2022. **223**: p. 109500 DOI: https://doi.org/10.1016/j.buildenv.2022.109500.
26. Haynes, A., et al., *Sun-protective clothing and shade use in public outdoor leisure settings from 1992 to 2019: Results from cross-sectional observational surveys in Melbourne, Australia.* Preventive Medicine, 2020. **139**: p. 106230.
27. Ziehfreund, S., B. Schuster, and A. Zink, *Primary prevention of keratinocyte carcinoma among outdoor workers, the general population and medical professionals: a systematic review updated for 2019.* Journal of the European Academy of Dermatology & Venereology, 2019. **33**(8): p. 1477-1495.
28. Hooper, P., et al., *Are we developing walkable suburbs through urban planning policy? Identifying the mix of design requirements to optimise walking outcomes from the 'Liveable Neighbourhoods' planning policy in Perth, Western Australia.* Int J Behav Nutr Phys Act, 2015. **12**: p. 63 DOI: 10.1186/s12966-015-0225-1.
29. Stoneham, M., C. Earl, and L. Baldwin, *Creating Shade at Public Facilities: Policy and Guidelines for Local Government (Edition 2)*. 2007, Australian Institute of Environmental Health (AIEH): Australia.
30. Government Architects NSW. *Draft greener places design guide*. 2020: NSW.
31. Australian Institute of Landscape Architects. *ShadeSmart: Continuing Professional Development Program*. 2022 06/10/2022]; Available from: https://www.aila.org.au/Web/Web/Education/Events-and-CPD/Shadesmart.aspx.
32. Cancer Institute NSW. *Playground shade best practice principles for action*, C.I. NSW, Editor. 2022.
33. Wagga Wagga Council. *MINUTES of the ORDINARY MEETING OF COUNCIL held on Monday 22 August 2022: RP-7- RESPONSE TO NOTICE OF MOTION - SHADE SAILS OVER PLAYGROUNDS*. 2022 18/11/2022]; Available from: https://meetings.wagga.nsw.gov.au/Open/2022/08/OC_22082022_MIN_4878_WEB.htm.
34. Scenic Rim Regional Council. *Playground Strategy*. 2019: Queensland.
35. Cancer Council Western Australia. *The shade handbook: A practical guide to shade development in Western Australia*. 2020: WA.
36. National Institute of Health and Care Excellence. *Skin cacer prevention: Public health guideline*, NICE, Editor. 2011: UK.
37. Parisi, A.V. and D.J. Turnbull, *Shade provision for UV minimization: a review.* Photochemistry and photobiology, 2014. **90**(3): p. 479-490.
38. Cancer Institute NSW. *How schools, councils, community groups and sporting organisations created shade: 10 Case studies* 2014, Canbcer Institute NSW: Syndey.

Appendix 1: Description & timeline for three projects that preceded this work.

As part of implementing the NSW Skin Cancer Prevention Strategy (2017), a Shade Working Group was reconvened to develop a work plan with three strategic priority areas: awareness raising & education; advocacy & advice; & the creation of new evidence [20]. Through this plan, the Cancer Institute NSW, Cancer Council NSW & the Shade Working Group, initiated four projects to integrate shade provision into the healthy built environment agenda.

- **Project 1: Promotion of the inclusion of shade in local government planning statements.** In 2019-20, Cancer Institute NSW & Cancer Council NSW promoted the inclusion of shade to reduce ultra-violet (UV) radiation overexposure in the long-term Local Strategic Planning Statements (LSPSs)[1] that each local council in NSW was required to develop. More than 240 submissions were made collectively by both organisations to at least 111 of the 128 councils in the state. The Shade & UV inclusion in NSW local government planning policy report [9] documents the impact of the Cancer Institute NSW submissions. Evaluation of this project found that amongst 59% of councils who received submissions, there was some evidence of adoption of recommendations in their LSPSs. Importantly, the project was also undertaken at a time of heightened NSW Government & council awareness of the importance of urban tree canopy cover as part of the Greening our City Premier's Priority.
- **Project 2: Benchmarking Shade in NSW Playgrounds**. The Cancer Institute NSW commissioned the Queensland University of Technology to benchmark the amount of shade available in NSW playgrounds. During a one-year period (2020-21), over 2,500 community-based playgrounds across 91 NSW local government areas (LGAs) were mapped virtually to ascertain the quality and quantity of shade. Alongside this, 82 onsite field visits to playgrounds for physical mapping were undertaken across 52 metropolitan and regional LGAs in NSW, with 29 of these LGAs in Sydney. The resulting Benchmarking Shade in NSW Playgrounds report [1] provided a baseline assessment of the amount of playground shade in NSW.
- **Project 3: ShadeSmart Continuing Professional Development (CPD) program for Landscape Architects.** In 2022, the ShadeSmart pilot program was launched in NSW with the Australian Institute of Landscape Architects (AILA). Two outputs that were delivered included the five CPD accredited training modules and the inclusion of the NSW ShadeSmart award within the AILA awards. The online modules are a technical resource, & module 2 on Shade and UV is practical [31]. In 2023 all AILA state & territory organisations introduced the ShadeSmart award to their awards process.
- **Project 4: Shade strategies.** In September 2022, the Cancer Institute NSW & the Cancer Council NSW partnered with the Sax Institute to explore strategies on what works to increase shade in NSW public playgrounds. The evidence review & this discussion paper are outputs from the project.

[1] A Local Strategic Planning Statement (LSPS) sets out the 20-year vision for a local government area, demonstrates how change will be managed and identifies local priorities for updating council Local Environmental Plans 40. Department, of, Planning, and, Environment. Local Strategic Planning Statements: Guidelines for Councils NSW.2018. [Available from: https://www.planning.nsw.gov.au/-/media/Files/DPE/Guidelines/local-strategic-planning-statements-guideline-for-councils-2018-06-12.pdf?la=en.

Appendix 2 Table 2— Strategies to support creating shade in playgrounds and other public spaces which had evidence of implementation, what they achieved and why they achieved what they did

Author, date (reference no.)	**Strategy (Policy, site audits, etc.)**	**Where?**	**What was achieved?**	**Why? (key factor(s) for success/failure)**
Targets				
CINSW, 2022 [32].	Targets	NSW	Advised shade should cover at least 70% of the play equipment and nearby seating, including 45% of tree shade.	Not Reported (NR)
Wagga Wagga Council, 2022 [11, 33]	Targets	NSW	Minimum 40%. Funds prioritised for playgrounds in Wagga Wagga which currently have playground shade of <40%.	NR
Scenic Rim Council, 2019 [34]	Targets	QLD	Minimum of 50% shaded area provided by sails or trees.	NR
Lismore Council, 1997 (in [1]).	Targets	NSW	Built shade over 100% of playground equipment; 40% of ground shaded (natural and built).	NR
Stoneham M, 2007 [29].	Targets	QLD	Natural shade covers 30% of ground; essential and preferred criteria for parks design.	NR

Author, date (reference no.)	Strategy (Policy, site audits, etc.)	Where?	What was achieved?	Why? (key factor(s) for success/failure)
City of Phoenix, 2010 [22].	Targets	Phoenix, USA	Vision to achieve 25% tree canopy cover for the city by 2030.	Public support.
Policies, guidelines and recommendations				
Kapelos et al., 2014 [13].	Shade Policy.	Toronto, Canada	The first city-level shade policy in North America in 2007.	A coalition of professionals.
Stoneham M, 2006 [29].	Model policy & guidelines for local government to adapt.	QLD	Lismore City Council (LCC): “tree planting at public reserves.”	A council department leading implementation.
Cancer Council NSW, 2013 [6].	Guidelines for planning shade.	NSW	NR	Generic enough for application to diverse sites.
Cancer Council WA, 2020 [35].	Generic guidelines based on above.	WA	NR	Generic enough for application to diverse sites.
NICE, 2011 [36].	Guidelines for primary prevention of skin cancer.	UK	NR	NR

Author, date (reference no.)	Strategy (Policy, site audits, etc.)	Where?	What was achieved?	Why? (key factor(s) for success/failure)
Government Architects NSW, 2020 [30].	Draft greener places design guidelines	NSW	NR. However, guide supported the NSW Government Premier's Priority: Greening Our City, to increase tree canopy.	Detailed differentiation of parks and playgrounds based on the users/usages they were intended for.
Cancer Institute NSW, 2022 [32].	Recommendations for action to create shade in playgrounds	NSW	Used in systematic follow-up of councils in NSW who received submissions to their local strategic planning statements [9].	Clear summary of actions and follow-up of councils.
Holman et al., 2018 [4].	Recommendations: surgeon general	USA	Call to action raised awareness about skin cancer.	Peak guidance disseminated widely.
Site audits and site-specific recommendations				
Toronto Cancer Prevention Coalition, 2010 [21].	Guidelines and site-specific shade audits to create site plans.	Toronto, Canada	Pilot study led to a cost-effective & streamlined audit process.	Pilot study in playgrounds in 2009 key to guideline adoption by the city of Toronto in 2010.
Holman et al., 2018 [4].	Shade audits	Multiple	The review provided a list of shade audit tools and guidelines.	NR
For more examples which include shade audits and/or site-specific guidelines see the above examples: Stoneham et al., 2006. Cancer Council NSW 2013, Cancer Council WA, 2020.				

Author, date (reference no.)	Strategy (Policy, site audits, etc.)	Where?	What was achieved?	Why? (key factor(s) for success/failure)
City level tree and shade master plan				
City of Phoenix, 2010. [22].	Tree and shade masterplan.	Phoenix, USA	Shade goals in Downtown Code and Strategic Plan.	Public support for action on sustainable cities.
Monetary incentives and equipment loans				
Parisi and Turnbull, 2014 [37].	Awards to councils.	QLD	Seven entries from six councils for the prize of $2500.	Low priority for councils given funds were small.
Parisi and Turnbull, 2014	Grants for community organizations.	QLD	Although the quality of shade provided was poor, 74% of the recipients were developing/had policies for UV minimization.	Financial incentive inadequate for larger organisations such as councils; and include a shade audit process.
Parisi and Turnbull, 2014	Grants for community	USA	Shade structures must satisfy stringent specifications.	Specific criteria on shade structure quality.
Parisi and Turnbull, 2014	Grants to local governments	NSW	Health-related grants program sustained by NSW health.	Cancer Council NSW involved during judging.

Author, date (reference no.)	Strategy (Policy, site audits, etc.)	Where?	What was achieved?	Why? (key factor(s) for success/failure)
Parisi and Turnbull, 2014	Loans to borrow shade structures	NZ	NR	NR
CINSW, 2014 [38]	Grant schemes	NSW	Report outlines 10 successful cases studies of building shade.	Success factors for individual cases varied.
Multi-component programs				
a. King et al. 2022 [20]. b. CINSW, 2022 [9]. c. Briant S, et al. 2021. [1].	Shade provision integrated into the healthy built environment planning agenda.	NSW	a. Modules for Landscape Architects on shade in urban design [31]. b. Distributed submissions to 111 of 125 NSW Councils [33]. c. Shade benchmarked in NSW playgrounds.	a. Shade Working Group members. b. Local government planning requirement. c. Partnership with university-based researchers (QUT & USQ).
Hill et al., 2019 [12].	Victoria's SunSmart policy	Victoria, Australia	*'.. studies have tracked policy development and practices in diverse settings .. demonstrated .. potential for environmental interventions to reduce exposure to ultraviolet radiation..'*	*'written policy .. helps to ensure the efforts are sustained.'*

See also Toronto Cancer Prevention Coalition, 2010, City of Phoenix, 2010 and Stoneham M, et al., 2006. NR = Not Reported.

Appendix 3 Table 3 — Trials of the effects of creating shade in parks and playgrounds

Author (date). Title	Country, location, context	Study design	Participants (number, sites). Study duration	Intervention description	Outcome measures	Main findings
Buller et al., (2017) Shade Sails and Passive Recreation in Public Parks of Melbourne and Denver: A Randomized Intervention.	Melbourne, Australia and Denver, USA. Passive Recreational Areas (PRAs) in public parks (i.e., areas used for sitting or standing while socializing, preparing or eating a meal, watching or coaching sports, watching a concert, taking a class, or waiting, or areas where people stroll for sightseeing or while observing outdoor displays)	RCT. Stratified randomized pre-test to post-test controlled design.	Adults observed using PRAs in parks. Randomized a sample of 144 public parks with 2 PRAs in full sun in a 1:3 ratio to treatment or control. 2011-2014 (3 years)	Shade sails were built at 1 PRA per treatment park. At treatment PRAs, shade sails were built to similar designs in both cities, with some variation to fit the site requirements and preference of the municipalities, between pre- and post-test assessments, by working with parks department staff and shade sail vendors.	The primary outcome was any observed use of the study PRA by adults who were assessed by trained research assistants.	PRAs where shade was built were significantly more likely to be used than those where no shade was built. Adjusting for clustering of observations within parks and covariates, shaded PRAs (adjusted probability of PRA in use: pre-test = 0.10, post-test = 0.32) were more likely to be in use at post-test than unshaded control PRAs (pre-test = 0.14, post-test = 0.17), with a treatment group testing period odds ratio (OR) of 3.91 (z= 3.24; 95% confidence interval [CI] = 1.71, 8.94; P= .001).
Dobbinson et al., (2020). Examining Health-Related Effects of Refurbishment to Parks in a Lower Socioeconomic Area: The ShadePlus Natural Experiment.	Melbourne, Australia. Three intervention and three comparison parks in Brimbank City Council, a local government area with a program of planned park refurbishments and located in one of the lowest socioeconomic areas of Melbourne.	Natural experiment.	Observations of people at the six parks were: T1 (2013-14), n=1670; T2 (2014-2015), n=2377; and T3 (2015-2016), n=2128. 3 years duration.	Planned refurbishments included features that might promote park-based physical activity (playground equipment and quality walking paths) and sun protection (built shade including a shade-sail for the children's playground). While comparison parks amenities remained largely unchanged across the study.	Primary outcomes: number (no.) of people observed in the park; no. of people observed engaging in active recreation; and no. of people observed using shade.	The study found more visitors used the refurbished parks than the comparison parks - from T1 to T2 124% increase in mean park use at the intervention parks relative to a 5% increase at comparison parks. Parks that installed shade sails over the playground showed an increase in shade use. It is likely that this positive effect on shade use was partly related to installation of shade sails over the well-designed playgrounds, in

Author (date). Title	Country, location, context	Study design	Participants (number, sites). Study duration	Intervention description	Outcome measures	Main findings
						addition to providing the roofed shade at picnic areas.
Dobbinson et al., (2022). Solar UV Measured under Built-Shade in Public Parks: Findings from a Randomized Trial in Denver and Melbourne.	Melbourne, Australia and Denver, USA. Passive recitation areas (PRAs) in public parks (i.e., areas used for sitting or standing while socializing, preparing or eating a meal, watching or coaching sports, watching a concert, taking a class, or waiting, or areas where people stroll for sightseeing or while observing outdoor displays)	RCT.	UV measurements (n=1144) were conducted at the center and periphery of PRAs in a total sample of 144 public parks as part of pre-test and post-test measures of use of the PRAs by park visitors for 3 recruitment waves per city in 2010-14.	Intervention site shade structures were built to similar designs in both cities. This study quantified UV levels under built-shade relative to unshaded PRAs over summer months in parks in two cities. Following pre-test, 36 PRAs had built shade and 108 did not.	At the end of each observation period the research staff recorded the solar UV levels at the boundary and center of the PRA.	After adjusting for the covariates, mean UV at the center of built-shade PRAs decreased from pre-test to post-test ($x = 3.39$, $x = 0.93$ SED), a change of $x = -3.47$ SED relative to control PRAs ($p < 0.001$). A substantial reduction in exposure to UV can be achieved using built shade with shade cloth designs, offering considerable protection for shade users.