A Wellbeing-themed submission for:
The Strategic Plan for Early Learning 2019-29

15 March 2019

This is a joint submission from people involved in research into, and the promotion of, wellbeing in the early childhood education and care sector. It covers a range of wellbeing topics, including mental and emotional health, physical environments, nutrition, and teacher health. It provides supporting evidence and guidance for the implementation of the Strategic Plan.

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About the contributors:

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Mike is a specialist in wellbeing and design for early education and care. Mike has worked with the sector for 27 years, was responsible for developing the Wellington Regional Public Health Unit's ECE programme, and for the drafting of the health resource *Nga Kupu Oranga*. Mike has a Master of Public Health (ECE health needs assessment) and has made about 1500 visits to around 700 ECE and care services across the ECE spectrum. He has also worked for five years in ECE outdoor area design. Mike is completing a PhD with the University of Otago (ECE indoor environments and health).

Keryn O'Neill, Knowledge Manager, Brainwave Trust

Brainwave Trust is a well-respected, independent, charitable organisation, which has been sharing research about the impact of children's early experiences on their development for over 20 years. Keryn has a BA (Education & Psychology), MA (Psychology), and Post Graduate Certificate in Educational Psychology. She has been involved in Research & Knowledge Management roles within Brainwave for 9 years. This has involved both oversight of and direct reviews of the scientific literature on many factors that can affect children's development. This includes an extensive literature review regarding the effects of ECE and childcare on children.

Cheryl Greenfield, retired, former of Manukau Institute of Technology

Cheryl has been a teacher at primary, early childhood and tertiary sectors for 44 years and has recently retired for role as Senior Lecturer at Manukau Institute of Technology on the B.Ed (Early Childhood Teaching) programme. Cheryl has a Master of Education (Hons) and is both internationally and nationally recognised for her research and advocacy in relation to early childhood outdoor environments. She has published a first and second edition of *Outside is Where We Need to Be: A guide to providing optimal outdoor environments in early childhood settings.*

Dr Sarah Gerritsen, University of Auckland

Sarah is a social scientist at the University of Auckland's School of Population Health, working in the field of public health nutrition and child health. This year she is leading the review of the Maternal, Infant and Toddler Dietary Guidelines for the Ministry of Health, and undertaking several research projects aimed at improving children's nutrition (funded by the Health Research Council and the Ministry of Social Development). Sarah has written two umbrella reviews: How We Eat (2017), a review of the evidence on food and eating behaviours for the Ministry of Health, and Healthy Food and Physical Activity Environments (2019) for the Healthier Lives National Science Challenge. Sarah's PhD (2017) was on the potential for early childhood education services to assist with population-level obesity prevention, which utilised data from the Growing Up in New Zealand longitudinal cohort study.

Susan Bates

Susan is an early childhood teacher and independent researcher. She has undertaken research in several fields and hopes the 2017-18 Teacher Health Survey which features in this submission, will be used as a foundation for further research into children's health, teacher well-being, fair employment and human rights.

Prof. Wyatt Page, Massey University, Wellington

Wyatt is the Associate Professor of Acoustics and Human Health, at Massey University, Wellington, and leads the research platform *Noise and its effect on Health.* He is co-principal editor of the New Zealand Acoustics Journal. Wyatt is also an experienced ex-Playcentre parent.

Submission outline

This submission covers ten topics related to child and teacher wellbeing:

1. Wellbeing, belonging and Te Whariki
2. Mental and emotional health
3. Spaces for living and learning
4. Air quality, heating, and ventilation
5. Noise
6. Nutrition and active movement
7. Infection control
8. Ergonomics and injury prevention
9. Teacher health and employment
10. Teacher education in health and wellbeing

The second part of this section contains a summary of key points from each topic area, followed by a summary of recommendations. The remainder of the submission provides detail and supporting evidence for the ten topics.

The overall direction of the Strategic Plan is very good, and every one of the five goals is very welcome. This submission provides recommendations and key information to support the implementation of the 10-year Strategic Plan.

The wellbeing of children and teachers in the ECE sector in New Zealand is a human rights issue.

Unfortunately this submission makes sad and sobering reading. It describes from empirical research and the observations of teachers and health professionals, the current conditions in ECE centres. While New Zealand has some beautiful centres, and has seen some really good innovation, most New Zealand children do not get to experience these higher quality environments. We need to acknowledge and deal with the problems in centres attended by the majority of children.

While New Zealand has done much to make early childhood education available to every child, the focus on education and learning, without attention to basic care and working conditions, has resulted in conditions damaging to children and teachers. One expression of this damage is the current teacher shortage in ECE. It can be hard for teachers to leave the profession, but the children themselves have no voice in the conditions to which they are subjected. Children tend to accept their situations as 'normal'. If you are attending a centre that you started in at six months or two years old, you have no reference points for comparison, even if you could express how you feel. This means that it is very difficult for parents of children in childcare, who on average spend less than 10 minutes a day at an ECE centre for pick up and drop off, to gauge quality.

Quality of Life

The 1986 *Ottawa Charter for Health Promotion* stated that:

"Health is … a resource for everyday life, not the objective of living.
Health cannot be separated from other goals"

The same is true for education, though perhaps to a slightly different extent.

We are always learning, but life is not only about learning. It is to be lived and enjoyed. Our development is physical, social and emotional as well as intellectual. The years before five should be carefree, and they should be fun. For many New Zealand children they will be neither for much of the time, not because of abusive home environments, but because in the pursuit of early learning, we forgot that care and quality of life matter too.

We need to give our children the time, the attention, the space to live. It's support for parents to have time to be parents, not telling them to engage with the paid workforce. It's good ratios, it's manageable, socially appropriate group size. It's giving children healthy, quality spaces, big enough to run in, big enough for real grass. It's giving them quiet, restful, uncrowded indoor spaces. It's giving them love, and valuing them now, for who they are now, as well as for their futures. Give them these things and quality of learning naturally follow.

Being honest – we need to acknowledge child care

This submission supports and endorses the statement from the Child Poverty Action Group submission for the Strategic Plan.

From the Child Poverty Action Group

The terminology 'Early Learning' reflects a schoolification orientation rather than affirming the holistic way in which young children who are well cared for learn and grow, spiritually, emotionally and physically, as well as cognitively. The centrality of 'wellbeing' in the vision (p. 7) for education, and the understanding of the value of a whole-community, wrap-around approach, demands a holistic approach to describing the sector and clearly identifying this focus. For the wellbeing of all children, we recommend that this holistic identity be informed by the notion of whakamana. The phrase 'early childhood care and education' is more in keeping with the current government's across-the-board policy priority of wellbeing, whilst 'early learning' is a narrow cognitivist lens that was more in keeping with the previous government's equally narrow priority of literacy and numeracy.

Recommendation:

Adopt the term Early Childhood Care and Education as opposed to Early Learning (ECCE).

Living and learning

We support the vision for the early learning system, that every child should "enjoy a good life, learn and thrive in high quality settings...". The New Zealand education and care system needs to move towards a quality-of-life emphasis, rather than simply a focus on pedagogy. While the contributors to this submission include advocates of early education, there is a need to recognise that for many children the environments for ECE and care are primarily living environments. They are residences for children for up to 55 hours per week. There is a need to move away from 'classrooms' in centre design, towards home-away-from-home. There is a need to use the word 'care' without suggesting in any way that this takes away from learning. Healthy, emotionally secure environments, especially those with caring relationships and a relaxed home-like environments, provide the best environment for learning. This is **Goal 2** – the provision of the resources, including spaces and relationships, that children need to thrive.

Ratios and workforce support

For this reason we very much support the proposed change to teacher:child ratios (**Goal 1.1)**, except that there is good reason to suggest that they should be better than the proposal in the draft Strategic Plan.

This needs to be treated with urgency, especially the improvement to ratios for children under two years old.

Urgency needs to take into account a serious problem in the ECE sector, which is the working conditions and employment conditions afflicting many teachers, which is also detrimental to the children in those poor quality centres. Poor quality is often a complex mix of understaffing, exploitation, and poor facility design, aside from inadequate ratios. This is likely to be the main reason for the current teacher shortage. Although the word 'crisis' has been used often in the past two or three years about other societal or workplace issues, it is an apt description of the current situation for ECE and care.

The loss of teachers from the sector is likely to continue, with a real danger of system collapse, unless there is a clear recognition of the current state of the ECE sector.

We very much endorse **Goal 3,** the support of the ECE workforce. This support needs to include improvements to employment conditions and improvements to teacher training.

A missing piece – Resource Consents and the RMA

One aspect missing from the strategic plan is coordination with wider central and local government. This is particularly important in relation to RMA implementation, that has seen children housed in commercial and industrial zones, and effectively treated as a noise nuisance. If we are to make 'he taonga, te tamaiti' a reality, we need to value them in our suburbs, streets, and parks. There is a need to review the implementation of the Resource Management Act, to ensure that national and local government policy does not ignore or work against children's needs. There is a need for an environmental standard for early education and care services, to guide Territorial Local Authorities

towards implementation of the Act in a way that treats children as citizens and respects children's rights.

Summary of key points from the detail sections

Detail Section One – wellbeing, belonging, and Te Whāriki

Wellbeing and belonging are the secure base from which children take on the world. They are essential to quality of life, and essential to healthy learning and socio-emotional development. They enable a willingness to investigate, to explore and try new things, to give a new experience or possibility your full attention, to overcome obstacles and challenges. We have tried to do Te Whāriki deconstructed, which is no whāriki at all. We need to get weaving, to reconnect wellbeing and belonging to the whāriki of child development.

Detail Section Two – mental and emotional health

Early experiences have a disproportionately greater impact on brain development than experiences occurring later in life. Young children's relationships with adults "affect virtually all aspects of their development - intellectual, social, emotional, physical, behavioural and moral". Stability of adult child relationships is crucial to healthy child development. There is a need for ECE and care services to support secure and consistent relationships with children, by increasing the teacher child ratios and addressing issues contributing to staff turnover. Teacher training and ongoing development needs to emphasise a strong understanding of the importance of warm, stable, responsive relationships; the crucial need for high quality and quantity early language input, from birth; and, the potentially lasting and damaging effects of ongoing early stress.

Detail Section Three – spaces for living and learning

New Zealand has inadequate allocation of space per child, both indoors and outdoors. There is a need to implement a phased, funded increase in indoor space per child to at least 3.25m^2, free of furniture, fixtures and fittings (Goal 1), or 3.5m^2 if furniture is included, and outdoor space to at least 7.0 m^2 per child, with a minimum 1/3 as grass and/or other natural play space intended for chid activities. Outdoor environments need to include natural spaces.

ECE and care environments must be designed as living spaces as well as learning spaces, with natural spaces, quiet spaces and protected activity and social spaces. The Ministry of Education must give attention to and share responsibility for the quality of indoor and outdoor spaces with ECE teachers and management. This must be part of ERO reviews.

Detail Section Four – heating, ventilation and air quality

2017 research found 90% of 22 centres non-compliant with New Zealand's worst-in-the world minimum temperature standard, and alarming levels of CO_2 in sleep rooms. The minimum

temperature in ECE and care must be increased to 18°C, consistent with NZ and international guidelines for housing, and international requirements for ECE and care. There is a need to address serious issues with ECE centre heating and ventilation performance. ECE and care centres should no longer be licensed in locations contrary to the Ministry of Education's own guidelines in relation to air quality. Existing poorly located centres should be phased out. There is a need to actively fund and support research into effective technologies for the heating and ventilation of ECE environments, to develop measurable requirements for indoor CO^2 levels, especially for sleep rooms, as a proxy indicator for ventilation, and to support research into outdoor air quality, surface contamination and centre location, especially in relation to roads and industrial areas. There is also a need for an ECE and care environmental standard to guide Resource Consent processes, that will prevent children being placed locations adverse to their health and development.

Detail Section Five – Noise

Noise is a serious problem in New Zealand ECE and care environments. In Massey University research 18% of children in sessional centres exceed 100% of the recommended maximum adult noise exposure dose (to prevent hearing damage), while for all-day centres close to half of all children (43%) exceeded this dose. Teachers and children have expressed distress at noise levels in ECE and care environments. In 2017-18 ECE teacher health survey with 706 respondents, (53%) of respondents reported that their workplaces were too noisy.

There is need to limit group size to reduce the sound loading in children's spaces, and to limit average sound pressure level to 65 dB (LAeq). Centres also need treatments to limit sound reverberation time.

Detail Section Six – Nutrition and active movement

Early childhood is widely regarded as the ideal time to develop behaviours that assist with lifelong healthy eating and physical activity patterns. Just over half (56%) of all ECE services in Auckland and Waikato in 2014 were providing some food to children daily. Unfortunately, an analysis of 57 menus from those districts found only 5% met all ten Ministry of Health nutrition guidelines. This meant that very few menus contained foods of sufficient quantity, variety and quality to meet half of a pre-schooler's nutritional needs, when assessed using criteria in the Ministry of Health's guidelines.

Intentional teaching of physical activity to children in NZ early education services appears low, and is the most effective way of increasing children's activity levels. There is a clear mismatch between the perception of ECE and care management and teachers, and the reality of sedentary behaviour of children in these environments. Active movement is also hindered by inadequate outdoor spaces.

There is a need to require ECE and care centres to create healthy food environments, ensure healthy foods, beverages and snacks are served, and ensure that food education and understanding are incorporated into the curriculum. There is also a need to ensure that active physical play is incorporated into the daily routine and curriculum.

Detail Section Seven – infection control

The relationship between childcare attendance and increased infection rates in children is well established. A 2007 systematic review of children exposed to childcare centres before three years of age found that for children attending childcare, compared with those cared for at home, risk was 40% greater for upper respiratory infections, 58% greater for otitis media, and 143% greater for otitis media with effusion, 110% more for lower respiratory infections and 40% more for diarrhoeal illness. New Zealand research in 2017 has shown illness rates that can easily exceed parents sick leave allowances, just to care for one child attending full time childcare.

There is a need for better practice and design information for centres to reduce infections, but most particularly for training for ECE teachers in the science of infection control, and it's application in a the Te Whāriki context.

Detail Section Eight – Ergonomics and Injury prevention

ECE and care environments need to cater for two very different populations, the children and the teachers. This requires special consideration of ergonomics to meet the needs of both groups. The work of the Wellington Regional Public Health Unit ECE centre programme in the 1990s and 2000s revealed widespread problems with ergonomics for teachers. The Public Health Unit staff observed very poor outdoor area design, especially in relation to sandpits covers, with low level heavy lifting and bending. Storage facilities were badly designed, requiring teachers to get out and put away equipment the children could have obtained for themselves.

Of the respondents in a 2017-18 teacher health survey, 44% of teachers had sustained an injury in the previous 12 months. A quarter of teachers had experienced injury to the lower back in that one year, while of those who experienced any injuries in the previous twelve months 60% had lower back injury.

Workplace New Zealand and ACC need to undertake an investigation of injuries to early childhood teachers. Early childhood centre management and teachers need to be provided with training in ergonomics, hazard reduction for adults and design and practice to avoid injury. Adequate adult furniture in activity areas and associated with settling children to sleep must be mandatory. A standard is need for nappy change and bathing area design to avoid poorly designed facilities. Improvements to space are needed to reduce injuries caused by room congestion.

Detail Section Nine – teacher health and employment

There have been indications from the news media and social media that stress is an issue for ECE teachers, along with workplace bullying and poor working conditions. In 2017-18 there were at least three instances of teachers using disguised voice in the news media (and disguised face for TV) when describing very bad working conditions and employer bullying.

ECE teaching carries a strong emotional load, as teachers need to relate to children at a personal level, and manage a wide range of challenging socio-emotional conditions in the children they care for. In the 2017-18 teacher health survey survey there were four direct questions about stress. Only 42% of teachers (299) answered these questions. Of these respondents 43% described their jobs as 'stressful' and 31% (93) as 'very stressful' have in common, a total of 74% (220). When asked to rate symptoms that can be stress related all teachers responded, and a significant proportion (up to

25%) showed they were likely to be suffering from stress in their workplaces, even though they declined to answer the direct stress questions.

The Ministry of Education needs to work with Employment NZ and Worksafe NZ to encourage a culture of respect for the teaching workforce. Workplace bullying in ECE environments needs to be regarded as a critical quality issue in relation to the care of children, and a concern for workforce retention. It must not be treated as only an issue between employers and employees.

Detail Section Ten – teacher education in health and wellbeing

Drawing an on a combined 30 years' experience in observations of ECE teacher knowledge, Mike Bedford and Susan Bates have observed significant gaps in teachers training.

There is a need for a Ministry of Education led review of teacher training programme, to ensure that the science of pedagogy and care is adequately taught in pre-service qualifications. There is a need for pre-service and in-service training in health science, ergonomics, design and self-care. There is a need for pre-service and in-service training in brain development and neuroscience, including relationships, secure attachment and health socio-emotional states conducive to learning and enjoyment of life.

Summary of Recommendations

The following recommendations have been collated to assist policy and implementation of the Strategic Plan. They do not follow the topical structure of the remainder of the submission. For example, teacher training needs were identified under several topics, but in this section have been grouped together.

Cross-government, research agencies and training organisations

1 Establish a cross-government agency that will function as a centre of expertise for education and care environments, with the following objectives:

- Provide evidence-based advice to government agencies to ensure policy and practice that protects the wellbeing of children and teachers, including physical, mental and emotional health, facility design and location. Government agencies would include, but not be limited to, the Ministries of Education, Health, Housing and Urban Development, the Children's Ministry, MSD, MBIE, Employment NZ, Worksafe NZ, and local government.

- Facilitate research into child and teacher wellbeing in the ECE context, with linkage to universities and other research organisations.

- Provide advice to the wider ECE sector, including private and community organisations and teacher training institutions.

This recommendation supports all of the goals in the Strategic Plan, but particularly the improvements to legislation, advice on group size and physical environments, teacher training and connection to wrap-around services. It provides a centre of expertise for the co-construction of progress tools, and assists innovation and improvement in the ECE sector. It can inform innovation hubs, and support coordinated and prioritised ECE sector research.

Infant and toddler mental and emotional health

2 Develop strategies to safeguard and promote infant and toddler mental and emotional health, and to promote secure relationships and attachment (Goal 1.2).

Environmental conditions and centre location

3 Develop measurable requirements for maximum indoor noise levels (Goal 1.4).

4 Develop measurable requirements for indoor CO_2 levels, especially for sleep rooms, as a proxy indicator for ventilation (Goal 1.4).

5 Support research into effective technologies for heating, ventilation, and acoustic design (Goal 1.4).

6 Support research into outdoor air quality, surface contamination and centre location, especially in relation to roads and industrial areas (Goal 1.4).

7 Develop an environmental standard for education and care services (including considerations such as location, air quality, accessibility of other environments via footpaths), for application to Resource Consent processes (Goal 1).

8 Develop a comprehensive standard for early education a care facility design, including standards suitable for babies to five years olds, encompassing living, learning and whole body development. This standard should replace *NZS 5828:2015 Playground equipment and surfacing*. The outdoor elements of the standard can draw on the science of NZS 5828, but should recognise the supervised learning environment, and the need for appropriate outdoor developmental spaces for infants and toddlers (Goal 1.4).

9 Provide recommendations for hygiene products appropriate to the ECE environment (Goal 1.4).

10 In cooperation with ACC, develop ergonomic guidelines for facility and equipment design, for both children and teachers, and strengthen incentives for adult injury prevention (Goal 1.4).

Food, nutrition and physical activity (Success measure 1)

11 Develop guidelines for outdoor areas based on children's physical and cognitive developmental needs (Goals 1.4 and 2.2).

12 Develop nutrition and activity guidelines specifically for the ECE and care sector in New Zealand, preferably based on the World Health Organization's nutrition, physical activity, sedentary behaviour and sleep guidelines for early childhood education and care settings, which are currently under development.

13 Replace the commercial food service based MPI inspection programme for ECE centres with a food quality and hygiene assessment designed for ECE and care environments.

Infections (Success measure 1)

14 The Ministries of Health and Education, as well as Public Health Units, Medical Officers and Health Protection Officers need to take infections in ECE and care environments seriously, providing clear and appropriate advice on infection control. To this end, training is required for Public Health Unit staff engaging with ECE centres, including Medical Officers and other staff providing advice. Rather than leaving the development of resources to individual Public Health Units, there is a need for well researched, appropriately written national resources for ECE teachers and managers.

15 The Ministry of Health, with the assistance of the Ministry of Education, needs to develop monitoring systems for the health of children in ECE and care including infection surveillance (Goal 1.7).

Teacher training (Goal 3)

16 There is a need for a Ministry of Education led review of teacher training programme, to ensure that the science of pedagogy and care is adequately taught in pre-service qualifications.

17 The Ministries of Health and Education need to develop a national programme, in cooperation with teacher training providers, for teacher pre-service and in-service health and wellbeing training (Goal 3.3).

18 There is a need for pre-service and in-service training in health science, ergonomics, design and self-care. Early childhood centre management and teachers need to be provided with training in hazard reduction for adults, and design and practice to avoid injury. This should be an essential element in pre-service and in-service teacher training.

19 Implement teacher training in noise management.

20 There is a need for pre-service and in-service training in brain development and neuroscience, including relationships, secure attachment and health socio-emotional states conducive to learning and enjoyment of life.

21 Teacher training and ongoing development needs to include a strong understanding of the importance of warm, stable, responsive relationships; the crucial need for high quality and quantity early language input, from birth; and, the potentially lasting and damaging effects of ongoing early stress.

22 Implement appropriate teacher training for nutrition and food hygiene in ECE environments that will promote both nutrition and quality of life (incorporating aspects of the Heart Foundation's Healthy Heart Award (HHA) and/or Under 5 Energize into teacher training and professional practice).

23 ECE teachers, owners and managers must have a 'critical pedagogy of place; taking a critical appraisal of the purpose and value of their outdoor areas; and there needs to be a strengthening of self-review of outdoor play space.

Ministry of Education

Cooperation with research

24 Require licensed ECE Services to provide access for, and reasonable cooperation with, Ministry of Education approved research, as long as this does not require unreasonable time from, or disrupt, the ECE Service. Examples of research activity requiring access and cooperation include environmental measurements and monitoring, dissemination of research information and invitations to parents, on site observation, and interviews with management and staff and children within reasonable time constraints.

Low quality services and staff turnover (Goal 1.6, Goal 3)

25 Actively monitor staff turnover. High staff turnover in any centre should be regarded as a wellbeing and quality issue, and for children under three years old, a critical quality concern. This action should be implemented immediately (Goals 1.2 and 1.7, success measure 6).

26 This submission supports preventing low quality service providers from opening additional services (Goal 1.6).

Child-centred service provision

27 Address structure and funding issues so that children attend ECE for only as much time as is in their best interests or the needs of their family, e.g. make part day and fewer days a real and supported possibility (Goal 4).

28 Ensure children living in areas of greater deprivation have truly high quality ECE options available in their vicinity (Goal 2.1).

Ratios (Goal 1.1)

29 We strongly support the Strategic Plan goals to improve ratios and to limit group size. These two factors are related to the difference between calm, busy environments and noisy chaotic ones in which injuries are more likely. While the proposed change from 1:5 ratio for 0-2s to 1:4 ratio is definitely a step in the right direction it is not sufficient to ensure infant and toddlers' needs are met, efforts should be made to achieve a 1:3 ratio for this group.

30 Improvements to ratios need to be treated with urgency (recognising the workforce requirements to achieve this).

Indoor and outdoor environments (Goals 1 and 3)

31 Implement a phased, funded increase in outdoor space to 7.0 m^2 per child, with a minimum 1/3 as grass and/or other natural play space intended for chid activities (Goal 1).

32 Implement a phased, funded increase in indoor space per child to at least 3.25m^2, free of furniture, fixtures and fittings (Goal 1), or 3.5m^2 if furniture is included (Goal 1).

33 Children with special needs require higher standards for spaces, ratios, and group size limits, as well as specific training for ECE teachers. To achieve this there is a need for targeted funding (Goal 1, Goal 2.1).

34 Investigate and implement remote monitoring systems for noise, temperature and CO_2 levels, with alerts for centre staff (Goal 1.7).

35 Increase the minimum indoor temperature requirement to 18°C (Goal 1).

36 Outdoor environments should be large enough, with sufficient space per child, to allow children to be vigorously active, for example, to run.

37 Put an immediate stop to the licensing of centres with no green space, or in locations within 20 metres of a busy road or busy intersection within 100 metres of a motorway, or in other places with a high risk of air pollution such as near railway or industrial area, near land that has been contaminated, for example, by industry or horticulture, or near petrol stations or services like spray painters.

38 Actively enforce performance-based heating and ventilation requirements. The responsibility lies with the centre management to implement effective technology for these performance standards (Goal 1.7).

39 The Ministry of Education when licensing, and Education Review Office when monitoring, must share responsibility for the quality of indoor and outdoor spaces with early childhood teachers and centre management. This has been lacking in both licensing and ERO reviews.

40 Actively fund and support research into effective technologies for the heating and ventilation of ECE environments, and acoustic design (to support Recommendation 16) (Goal 1.4).

41 Indoor spaces should include genuine quiet spaces available at all times, and small-scale space where children can have a sense of enclosure, privacy and security.

42 Limit the average sound pressure level in children's spaces when operational to 65 dB LAeq (Goal 1.4).

43 Ensure that all centres have appropriate acoustic treatment so that the reverberation time is in the range 0.4 - 0.6 seconds or lower (Goal 1.4).

44 ECE teachers should actively lead children in energetic play and structured games or activities that promote outdoor play and movement.

45 Indoor spaces should include space for uninterrupted constructive play, where the product of a child's activity is not crowded or disrupted by other children accessing resources.

46 Encourage design and practice that engages children with food, for example the kitchen being connected to the activity space, opportunities for children to help with food service, and on-site growing of vegetables and fruit, should be actively promoted by the Ministry of Education.

47 The Ministry of Education and the Education Review Office must ensure that early childhood centres provide experiences and create outdoor spaces where children can build relationships of care for each other, other living beings, for the place itself and for spaces in the wider community. The must take responsibility to organise the environment in such a way that it invites cooperation, experimentation, responsibility, and respect; ensuring that children have ease of access to the outdoors.

48 There must be a concerted effort for provision of optimal outdoor environments (physical settings plus wise adults) that will support the development of environmental competence, a love of nature, an understanding of and respect for Papatūānuku; a fascination for and wonder of how nature works; and an understanding that humans are dependent on nature.

49 Across the ECE and care sector there needs to be a goal to seek harmony across pedagogical values, ensuring that the principles of Te Whāriki: He whariki māturanga mo ngā mokopuna o Aotearoa: Early childhood curriculum are upheld and then it follows that the outdoor environments the teachers create will respect children in a way that honours and facilitates their holistic development.

50 Develop guidelines for excursions that encourage frequent connection with the community and with natural spaces (Success measure 3).

51 Require all ECE services for children under one year old to provide suitable facilities for breastfeeding (Goal 1, success measures 1-3).

Ministry of Education, Employment NZ and Worksafe NZ (Goal 3)

52 Increase minimum sick leave provision to 10 days per year, and/or improve leave provision for the care of a dependent.

53 Address issues contributing to staff turnover, in order to promote consistent relationships for infants and children.

54 Workplace New Zealand and ACC need to undertake an investigation of injuries to early childhood teachers. The ACC category of 'Early childhood worker' needs to be split in to teachers and non-teaching staff, as the non-teaching statistics, which will include administrative staff and food handlers, will dilute the teacher statistics.

55 Workplace New Zealand needs to enforce the health and Safety at Work Act 2015 in ECE environments, with prosecution for unsafe facilities and practices as necessary.

56 Adequate adult furniture in activity areas and associated with settling children to sleep must be mandatory. Toddler rooms need adult chairs to hold and comfort distressed children, or to change children's clothes, socks and shoes.

57 Space needs to be improved to avoid congested areas with trip and legs injury hazards. This is of utmost importance in infant and toddler areas, where a teacher is more likely to be carrying a child.

58 A standard is needed for nappy change and bathing area design to avoid poorly designed facilities. The use of 'shubs' for bathing is particularly inappropriate given the risk of back injury. The need to be replaced with wet area showers with detachable shower heads, and in-bench infant bathing tubs if that age group is present.

59 The Ministry of Education needs to work with Worksafe NZ to encourage a culture of respect for the teaching workforce.

60 Workplace bullying in ECE environments needs to be regarded as a critical quality issue in relation to the care of children, and a concern for workforce retention. It must not be treated as only an issue between employers and employees.

61 There must be adequate staffrooms included in every ECE and care centre providing restful, comfortable space for recuperation and time to use them. It is essential that teachers are provided with the breaks they are entitled to. This is a teaching and quality of care issue as well as an employment issue. It must be addressed by the Ministry of Education.

62 Teachers and other ECE and care staff are exposed to infections via the children, and need sick leave to cover this. It is neither reasonable nor good practice to require teachers to work while sick. Minimum sick leave needs to be increased to at least 10 days per year.

63 There is a need for compassionate recognition of and support for teachers who have specific health problems or disabilities. Pre-diabetic and diabetic teachers for example, must be given decent regular breaks to manage their insulin levels. Those who are sensitive to noise must be given respite during the day.

Detail Section One

Wellbeing, belonging, and Te Whāriki

Mike Bedford

This is a brief, scene setting section, but I believe it is vital to our understanding wellbeing in ECE and care.

Someone in a senior education role once said to me,

'You do health, we do education, I really don't get the connection.'

The remarkable thing about this statement, is that without wellbeing and belonging, Te Whariki doesn't exist.

Te Whāriki deconstructed

Te Whāriki is not just a great educational model, it is a brilliant human development model. In Te Whāriki, two strands – wellbeing and belonging, provide the platform for growth and enjoyment of life. Contribution, communication and exploration are enabled and emboldened by being healthy, emotionally strong, and secure. A whāriki is a structural whole, in which every strand supports every other strand.

Nga whāriki are weavings. If there is no weaving, no connection between the parts, then there is no whāriki. Unfortunately, despite possessing this knowledge, it may be that we have tried to give children (and teachers, in their training) Te Whāriki deconstructed. A deconstructed whāriki is a broken thing, not fit for purpose. In the same way, the neglect of wellbeing in ECE and care has produced a broken thing that damages teachers and children.

It is essential that we weave wellbeing and care – and more than that, **love**, back into the whāriki. What does this look like? It means recognising that children love small enclosed spaces – it's part of their emotional wellbeing, for socialisation, observation and contemplation. It's being able to teach, as a four year old, the younger ones *how to wash and dry their hands really well, like this!* It's learning empathy, as in the movie *Inside Out*, and knowing how to care for your friend when they are sad. It's knowing that you are known, secure and loved, not just another child to be organised or supervised. Its knowing that as a teacher, you are appreciated and valued, and treated with respect, as person who deserves care too.

Cross-government response

I have sometimes said that when trying to work with the Ministries of Education and Health, it is like sitting in a rowboat, trying to pull two aircraft carriers together. The Ministry of Education has no dedicated full-time role in ECE wellbeing, and Ministry of Health has no dedicated full time role for ECE and care. Wellbeing in ECE and care have fallen down into the intervening chasm, leaving only

pedagogy, and that skeletonised version of wellbeing called 'health and safety'. The trouble is, this arrangement destroys both pedagogy and 'health and safety'.

There is a desperate need for cross-government understanding and response to the complexities of care and education for very young children. From baby to five years old is an enormous developmental range, but in addition there are many environmental factors including centre location and air quality, and Resource Consents to consider.

We need to repair the whāriki of child development, but we also need another whāriki, the weaving together of government agencies, equipped with adequate understanding of the realities of ECE and care, to support children and teachers.

See recommendation 1, p11.

Detail Section Two

Mental and emotional wellbeing

Keryn O'Neill for Brainwave Trust Aotearoa

Introduction

Brainwave Trust Aotearoa reviews research from a variety of academic disciplines, including neuroscience, psychology, and psychiatry. This large and growing body of research clearly indicates that "what happens in the life of a young child can either help or hinder their healthy brain development and subsequent outcomes in many areas" [1].

Our purpose is to increase understanding of the factors that influence infant and young children's development, with the aim of improving their outcomes. Our particular focus is on children's early experiences, from conception to around 3 years of age.

Key themes

Based on our reviews of the literature, there are several key themes that underpin the information we share.

- Early experiences have a disproportionately greater impact on brain development than experiences occurring later in life. These experiences can affect the way people think, feel, and behave throughout life. Yet this is a life stage that is so easy to underestimate.

- Genes contribute to development, but whether or how genes are expressed is influenced by experiences, particularly those occurring during periods of rapid brain development.

- Infant and children's experiences, in conjunction with their genes, can either help (protective factors) or hinder (risk factors) their healthy development.

Stability of relationships

Young children's relationships with adults "affect virtually all aspects of their development - intellectual, social, emotional, physical, behavioural and moral" [2]. Stability of adult child relationships is crucial to healthy child development. Within the ECE environment, instability of care due to factors such as staff turnover [3] increases the risk of later difficulties [4]. These difficulties include behavioural difficulties, poorer social adjustment and attachment difficulties [5-7].

Most people recognise that infants need physical support, such as keeping them warm and fed. They also need emotional support, as they are not yet able to manage their feelings by themselves. How well they learn to understand and increasingly handle their range of emotions, depends to a large extent on the quality of care and support provided by adults, in their infancy and early years. "There is broad scientific consensus that child development is profoundly impacted by the quality of

early caregiving" [8]. Sensitive caregiving, which includes prompt and effective responses [9] to infant and children's needs is "biologically essential" [10].

When adult: infant ratios are 1:5 it almost guarantees that "even the most skilled and highly trained carers are frustrated in their attempts" to develop the relationships the children in their care need to develop optimally [11].

Stress

Stress can be experienced at any age, including infancy. Some stress is normal, and can be positive. However, stress that is ongoing or when adult support is lacking can have a lasting negative effect on a child's brain development [12].

In infancy and early childhood stress is provoked not only by adverse events occurring, but by the absence of responsive care, which is perceived by the child as a serious threat. [10]. "When decreased responsiveness persists, the lost opportunities associated with diminished interaction can be compounded by the adverse impacts of excessive stress activation, the physiological effects of which can have lifelong consequences" [10].

The role of cortisol response

Real and perceived threats lead to the stress response, which involves a number of hormones and neurochemicals, including cortisol [13]. Prolonged cortisol elevation can affect the structure and function of the brain, particularly during periods of greater development, as in the early years.

The quality of ECE that young children receive "plays an important role in whether (and to what extent) their brains are exposed to elevated stress hormones early in life" [12]. Children in poor quality ECE show more elevated levels of cortisol than children in higher quality care [12].

The long hours spent in ECE by many young children contribute to altered cortisol patterns, with those attending for fewer hours per week (either fewer days per week, or half days as opposed to full days) less affected [14]. Physiological disruptions to the stress response system, can last into adulthood, resulting in increased mental ill-health [15], including both internalising and externalising disorders [16].

This has implications for the structure of ECE provision. Flexibility of funding and other structures to ensure children's hours and days of attendance are based on their needs, and secondly, those of their families, and not of the service provider. For example, centres requiring children to be in care for longer than they or their families need.

Children facing adversity – 'double jeopardy'?

Whilst children facing adversity may gain benefits from high quality Early Childhood Education, they are less likely to access this than their more advantaged peers. Services assessed as poor quality by ERO (Education Review Office) are over represented in more disadvantaged neighbourhoods [ECE Sector Advisory Group, cited by 17]. This means many children are vulnerable to the "double jeopardy" of experiencing both poor home environments, and poor quality ECE [18] thereby compounding the risk of poor outcomes in mental health and other areas.

The proposal (4.6) to set up high quality state-owned early learning services, with an associated research programme could have multiple benefits. These include for the children themselves, as well as providing models of what truly high-quality ECE looks like.

The Role of Language

Children's language skills have obvious implications for their later academic success. These are less obvious, but arguably more important socio-emotional effects that are also linked to language skills. Poor language skills have been linked with poorer mental health [19], increased likelihood of delinquent behaviour in adolescence [20], and adult crime [21], for example.

Aspects of language development have 'sensitive periods' during which experience plays a particularly crucial role in influencing brain development [22]. When infants and children do not receive the input they need, it can be extremely difficult for those skills to develop well later [23].

There are 168 different languages spoken by New Zealand children [30]. By two years of age, 40% of children understand two or more languages [31]. It is important that the particular language needs of these infants and children are well met when attending ECE.

Several aspects of language interaction are important. In brief, these are

- The quality of language used (e.g. varied vocabulary, fluency in the language spoken, an optimal level of challenge). Infants and children need adults who are fluent in the language(s) that matter to that child and their family, so they are able to engage in high quality language interactions.

- The quantity of language spoken. Multiple studies indicate that higher amounts of parental language input are associated with better language skills for children, and their associated benefits [24].

- Adult responsiveness. For language development, and for social & emotional development, adult communication needs to be contingent on the infant or child's communication. This includes the non-verbal communication of infants, such as gaze & gestures [24]. Particularly in infancy, this requires an adult who knows the individual child well, and thus gets to know, understand, and be able to respond effectively to each individual child.

Implications of this in the ECE environment include:

- Ministry, provider and teacher awareness of the vital importance of early language interaction, and the life-long implications when this does not occur.

- Teacher: child ratios and group sizes that enable and facilitate plenty of 1:1 interaction for every child, with an adult with whom they have a relationship.

- Whilst the proposed change from 1:5 ratio for 0-2s to 1:4 ratio is definitely a step in the right direction it is not sufficient to ensure infant and toddlers' needs are met.

- Particular attention paid to effective provision for the language needs of the many children whose dominant language is not English.

Supporting children's oral language learning is a crucial ingredient of their health and development, both now, and in their future. The finding that almost one third of ECE centres are not doing this is of huge concern.

Summary of research on Early Intervention Studies

An extensive review of the literature regarding ECE included some much-cited specific early interventions. It is worth noting some of the common elements of those services that are associated with improved outcomes for children.

These include:

- ECE has been of a higher quality than that which is typically available (for example, teacher training, teacher payment, teacher: child ratios, smaller groups)
- Additional services for the child and their family, for example, health services and parent support, such as weekly home visiting [25-27].
- The ECE component was usually, but not always, part-time, or sessional

Conclusions

Much is known about the significant and lasting impact that a child's early experiences can have, on all areas of their life, including their social and emotional functioning. The key is to act on this knowledge, without delay.

Given that non-parental care is a reality for so many New Zealand children, it is vital to ensure this care is of a consistently high quality, where the needs of young children are at the forefront.

Truly high quality care will be expensive [28]. There is a choice: pay now to ensure children get the start they deserve, or pay later, in both social and economic terms.

Recommendations

1 Require early learning services to support secure and consistent relationships with children (Goal 1.2).

2 Increase the teacher child ratios

3 Establish high quality state-owned early learning services, with an associated research programme (Goal 4.6)

4 Prevent low quality service providers from opening additional services (Goal 1.6)

5 Address issues contributing to staff turnover, in order to promote consistent relationships for infants and children.

6 Address structure and funding issues so that children attend ECE for only as much time as is in their best interests or the needs of their family, e.g. make part day and fewer days a real possibility.

7 Ensure children living in areas of greater deprivation have truly high quality ECE options available in their vicinity.

8 Teacher training and ongoing development to include a strong understanding of the importance of warm, stable, responsive relationships; the crucial need for high quality and quantity early language input, from birth; and, the potentially lasting and damaging effects of ongoing early stress.

Further reading

Setting the record straight on Perry preschool http://www.brainwave.org.nz/setting-the-record-straight-on-perry-preschool/

Nourishing our babies: Why listening and talking matter http://www.brainwave.org.nz/nourishing-our-babies-why-listening-and-talking-matter/

Behind the Headlines: Summary http://www.brainwave.org.nz/wp-content/uploads/behind_the_headlines-2page-summary-2017-1.pdf

Behind the Headlines: Early Childhood Education and Care: A literature review http://www.brainwave.org.nz/wp-content/uploads/BW-PUB-LIT-ECEC-Literature-Review-FINAL-7.12.2016.pdf

From certainty to complexity: Risk and protective factors in child development http://www.brainwave.org.nz/certainty-complexity/

Stress: the good the bad and the ugly http://www.brainwave.org.nz/stress-the-good-the-bad-and-the-ugly-2/

References

1. O'Neill, K.M., *Behind the Headlines: Early Childhood Education and Care: A literature Review* 2015, Brainwave Trust Aotearoa: Auckland, NZ.

2. National Scientific Council on the Developing Child, *Young children develop in an environment of relationships: Working Paper #1*. 2004.

3. UNICEF, *The Child Care Transition, Innocenti Report Card 8: A league table of early childhood education and care in economically advanced countries*. 2008, UNICEF Innocenti Research Centre: Florence, Italy.

4. Youngblade, L.M., *Peer and teacher ratings of third- and fourth-grade children's social behavior as a function of early maternal employment.* Journal of Child Psychology and Psychiatry, 2003. **44**(4): p. 477-488. 10.1111/1469-7610.00138

5. Morrissey, T.W., *Multiple child-care arrangements and young children's behavioural outcomes.* Child Development, 2009. **80**(1): p. 59-76.

6. Ansari, A. and A. Winsler, *Stability and sequence of center-based and family childcare: Links with low-income children's school readiness.* Children and Youth Services Review, 2013. **35**(2): p. 358-366. http://dx.doi.org/10.1016/j.childyouth.2012.11.017

7. NICHD Early Child Care Research Network, *Child Care in the first year of life*, in *Child Care and Child Development*, NICHD Early Child Care Research Network, Editor. 2005, The Guilford Press: New York, NY. p. 39-49.

8. Young, K.S., et al., *The neural basis of responsive caregiving behaviour: Investigating temporal dynamics within the parental brain.* Behavioural Brain Research, 2017. **325**: p. 105-116.

9. Vermeer, H.J. and M.G. Groeneveld, *Children's physiological responses to childcare.* Current Opinion in Psychology, 2017. **15**: p. 201-206.

10. National Scientific Council on the Developing Child, *The science of neglect: The persistent absence of responsive care disrupts the developing brain. Working Paper 12*. 2012, Harvard University.

11. Gunnar et al., 2010, cited by Rolfe, S.A., *Understanding relationships between professionl carers and infants in child care.* The First Years: New Zealand Journal of Infant and Toddler Education, 2000. **2**(1): p. 9-12.

12. National Scientific Council on the Developing Child, *Excessive Stress Disrupts the Architecture of the Developing Brain: Working Paper #3*. 2005/2014.

13. Bruce, J., et al., *Early adverse care, stress, neurobiology, and prevention science; lessons learned.* Prevention Science, 2013. **14**(3): p. 247-256.

14. Lumian, D.S., et al., *The impact of program structure on cortisol patterning in children attending out-of-home child care.* Early Childhood Research Quarterly, 2016. **34**: p. 92-103.

15. Shonkoff, J.P., et al., *The lifelong effects of early childhood adversity and toxic stress.* Pediatrics, 2012. **129**(1): p. e232-246.

16. Koss, K.J. and M.R. Gunnar, *Annual Research Review: Early adversity, the hypothalamic–pituitary–adrenocortical axis, and child psychopathology.* Journal of Child Psychology and Psychiatry, 2018. **59**(4): p. 327-346.

17. Ritchie, J., et al., *Our Children, our choice: Priorities for policy*. 2014, Child Poverty Action Group: Auckland, NZ.

18. Watamura, S.E., et al., *Double jeopardy: Poorer social-emotional outcomes for children in the NICHD SECCYD experiencing home and child-care environments that confer risk.* Child Development, 2011. **82**(1): p. 48-65.

19. Goldfeld, S., et al., *Epidemiology of positive mental health in a national census of children at school entry.* Journal of Epidemiology and Community Health, 2016. 10.1136/jech-2015-207061.

20. Snow, P. and M. Powell, *Youth (in)justice: Oral language competence in early life and risk for engagement in antisocial behaviour in adolescence*, in *Trends and issues in crime and criminal justice*. 2012, Criminology Research Council: Canberra, ACT. p. 1-6.

21. Shaw, A., *Read, speak, sing: Promoting literacy in the physician's office.* Paediatric and Child Health, 2015. **11**(9): p. 601-606.

22. National Scientific Council on the Developing Child, *The timing and quality of early experiences combine to shape brain architecture: Working Paper #5*. 2007.

23. Knudsen, E.I., *Sensitive periods in the development of the brain and behaviour.* Journal of Cognitive Neuroscience, 2004. **16**(8): p. 79-100.

24. Zauche, L.H., et al., *Influence of language nutrition on children's language and cognitive development: An integrated review.* Early Childhood Research Quarterly, 2016. **36**: p. 318-333.

25. Anderson, M.L., *Multiple inference and gender differnces in the effects of early intervention: A reevaluation of the Abecedarian, Perry Preschool, and early training projects.* Journal of the American Statistical Association, 2008. **103**(484): p. 1481-1495.

26. Ramey, C.T., et al., *Persistent effects of early childhood education on high risk children and their mothers.* Applied Developmental Science, 2000. **4**(1): p. 2-14.

27. Reynolds, A.J. and S.-R. Ou, *Paths of effects from preschool to adult well-being: A confirmatory analysis of the Child-Parent Center Program.* Child Development, 2011. **82**(2): p. 555-582.

28. Li, W., et al., *Timing of high-quality childcare and cognitive, language, and preacademic development.* Developmental Psychology, 2012. **49**(8): p. 1440-1451.

30. King, J., & Cunningham, U. (2017). Tamariki and fanau: Child speakers of Māori and Samoan in Aotearoa/New Zealand. *Te Reo, 60*, 29-46.

31. Morton, S. M. B., Atatoa Carr, P. E., Grant, C. C., Berry, S. D., Bandara, D. K., Mohal, J., . . . Wall, C. R. (2014). *Growing Up in New Zealand: A longitudinal study of New Zealand children and their families. Now we are Two: Describing our first 1000 days*. Retrieved from Auckland, NZ: www.growingup.co.nz

Detail Section Three

Spaces for living and learning

Cheryl Greenfield and Mike Bedford

In ECE and care settings, especially where children attend for a full day, the indoor and outdoor spaces need to serve two purposes:

- Living space
- Learning space

These spaces are not separate – they are one and the same. All space must serve both purposes. Activity space, indoors and outdoors must be living space. Dining areas and bathrooms are learning spaces.

Living space

These are spaces for living that need to meet the requirements of a home-away-from home. Both indoors and outdoors, they need to have spaces large enough and sufficiently uncrowded to permit solo space and small group (2-4) socialising without being pressed for room. They need quiet, restful spaces in addition to sleep spaces. They need spaces to get away from people and activities, as well as to enjoy them.

Learning space

Back in 1977 Jim Greenman and Ann Stonehouse described early learning this way:

"The educational programme does not happen in the environment; rather, the environment is the programme".

Everything in the child's space is part of their learning. Play, participation, and contribution, and trying ways of expression, are part of the learning process. A varied environment provides more opportunities for learning, and learning operates from the foundation of belonging in a physically and emotionally healthy space.

We need to get away from the idea that an ECE and care environment is early school, and to recognise the inbuilt desire to learn about the daily things of life – food, self-care, grass, insects, and friendships.

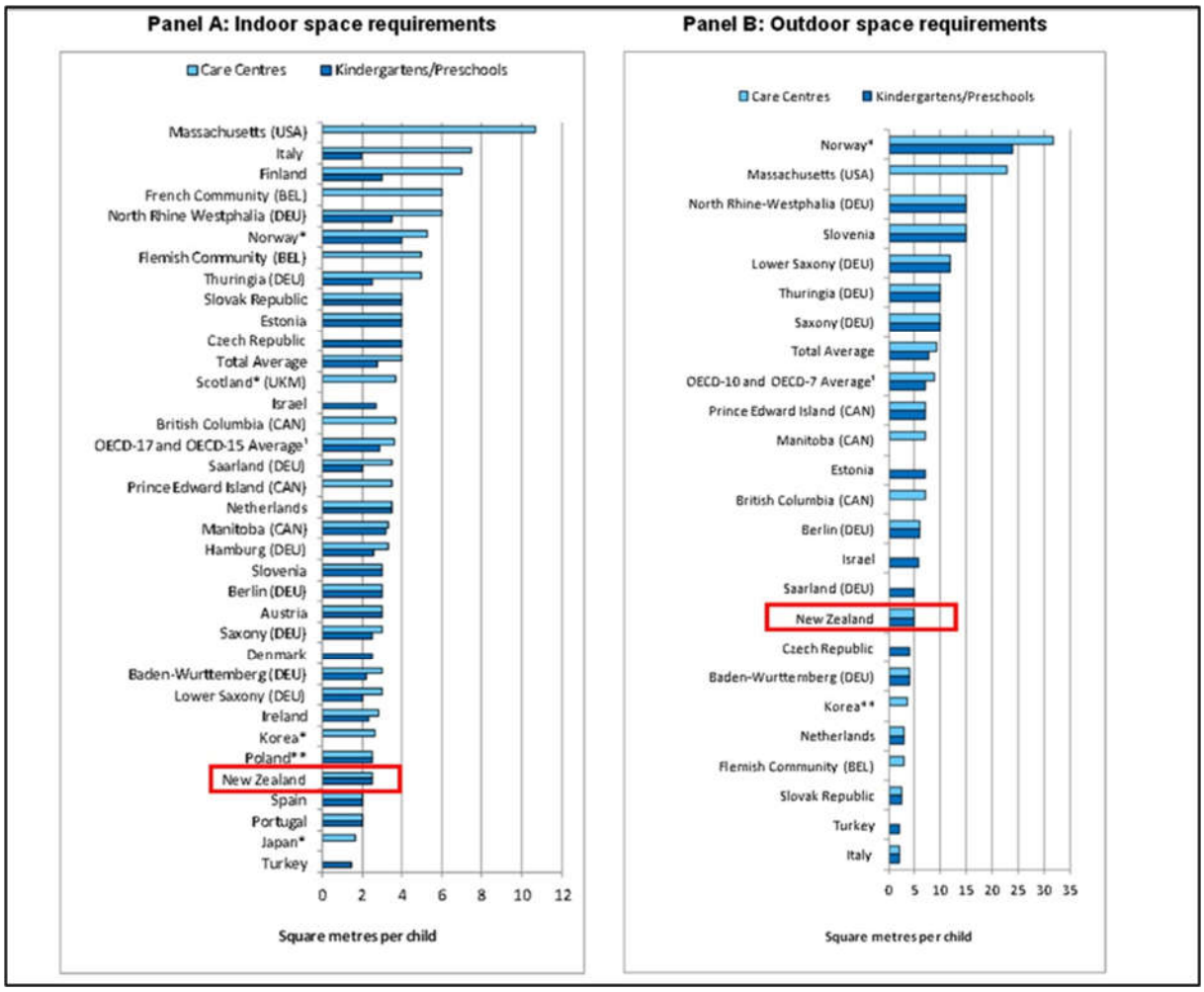
Crowded spaces

Unfortunately, while some ECE centres operate as living and learning second-home spaces, and can be beautiful, many are of such a design, level of crowding, and under-resourcing that both learning and quality of life are hindered.

New Zealand's minimum indoor and outdoor space is a major obstacle to quality of life, and to physical and intellectual development. The draft Strategic Plan did not specify an increase in spaces, but Goal 1.4 needs to address this problem.

The tables on the next pages show comparisons between New Zealand space per child and other jurisdictions. The first Table, from OECD.org, provides an international comparison, but it does not specify the way in which the space per child is calculated, and definitions can vary from one jurisdiction to another.

From OECD.org.



The next tables are from an English language Google search, and show both the specified m^2 per child and the equivalent if the New Zealand wording of 'free from fixtures and fittings' were applied. The calculation was based on 10% of floor area for furniture and 10% for 'fixtures and fittings'.

In the next table, *Indoor space requirements*, it can be seen that some jurisdictions provide variations in floor space depending on age, but the way in which age is considered is inconsistent. The most common floor space allocation per child was $3.25m^2$ (adjusted for equivalence to NZ wording), used in 11 US states. This is also the numerical value used in the Australian National Regulations, but those regulations refer to unencumbered floor space (equivalent to New Zealand's 'free of furniture and fittings' pre-2008 wording). This means that the Australian floor space is equivalent to $3.58m^2$ per child in NZ terms.

Indoor space requirements

Jurisdiction	Age or needs group	m^2	NZ equivalent m^2 by description
Montana	Special needs	5.00	5.50
Illinois	Play and sleep	5.11	4.60
Michigan	Infants & toddlers	4.65	4.18
Denver	Infants	4.65	4.18
Republic of Ireland	0-1 year	3.5	3.85
Isle of Man	Under two years	3.7	3.70
Saskatchewan		3.70	3.70
Vermont		3.25	3.58
Australian National Regulations		3.25	3.58
British Columbia		3.70	3.52
Minnesota		3.25	3.41
Oklahoma	Infants	3.72	3.34
Pennsylvania		3.72	3.34
Newfoundland and Labrador		3.30	3.30
11 US States	Includes Arizona <1 year	3.25	3.25
Republic of Ireland	1-2 years	2.8	3.08
Ontario		2.80	3.08
Texas		2.79	3.07
Manitoba		3.30	2.97
7 US States		3.25	2.93
United Kingdom	0-2 years	3.5	2.8
Denver	Other than infants	2.79	2.79
New Zealand pre-2008		**2.50**	**2.75**
Alabama		2.97	2.68
Republic of Ireland	2-3 years	2.36	2.6
Republic of Ireland	3-6 years	2.3	2.53
Tennessee		2.79	2.51
New Zealand			**2.50**
Arizona	Over 1 year	2.32	2.32
Isle of Man	Over 2 years	2.3	2.3
Illinois	Infants	2.32	2.09
United Kingdom	2-3 years	2.5	2
United Kingdom	Over 3 years	2.3	1.84

Outdoor space is more difficult to compare, as some jurisdictions only provide for a proportion (e.g. half or a third) of children to be outdoors at one time. In the web search seven US states and one Canadian state were found with this arrangement.

The most common outdoor space allocation in the USA and Canada, with either total or partial access, was 7m^2 (or 75 square feet). This also is the Australian federal requirement. For children over two years old, it was also the New Zealand requirement from 1960 until a reduction in 1985, when it was downgraded to the current 5m^2.

New Zealand has moved away from the allocation of outdoor space designed for children's development, with natural spaces and room for children to run. This progression is clearly seen in the Google Earth Image below. In this photo a school is seen next to a Playcentre for 30 children and a childcare centre (labelled a 'kindy') for 47 children. Playcentres and Free Kindergartens have typically had three to five times the regulated minimum space, hence the contrast between the Playcentre and childcare centre. The grassed area next to the school carpark is twice the size of the childcare centre outdoor area. The childcare centre does not have grass – the green is a synthetic surface, as the grass would not survive the concentrated use. Spaces this size are inevitability limited for variety and learning opportunities. Ironically, the children attending for the longest time get the least space, and the least quality of space for both living and learning.

Design

Outdoor spaces

In research into outdoor environments for early childhood there was an overarching finding that an optimal outdoor environment is one that supports relationships:

- between children
- between teachers and children
- between children, teachers, and the physical space, the natural world and community

and provides multiple and varied opportunities for play that supports and fosters the holistic development of the child.

'Relationships' and 'opportunities' are threads that weave through the characteristics of an optimal early childhood centre outdoor environment. Such an environment will have spaces and places:

1. Where children can be alone or with others
2. That invite and encourage a variety of opportunities /possibilities for learning and exploration in multiple ways
3. That offer children choices, engendering in them a sense of ownership, contribution and responsibility for their own learning
4. Where children can run and be physically challenged in multiple ways all year round
5. That are 'well' designed, resourced, maintained, and positioned, and are aesthetically pleasing and inviting for both children and adults
6. That provides contact with nature and natural world promoting sense of belonging
7. That provides an understanding life cycles and fosters sustainability
8. That has features that are particular to that centre /community context and accessible to children.

Having an open space where children have the freedom to run is vitally important. Spacious outdoor environments also allow for more secluded and intimate places to be created within it. Research has shown that teachers acknowledge and value the delight children exhibit in having secret places, places to hide away. These places included hiding among the lush vegetation, bushes, in forest areas, sitting on a swing, in a tree house and in 'caves and having different levels within the play space. Children's special places, or places that children make their own, contribute to the development of identity, imagination and commitment to place. Children have an intrinsic need for concealed places away from adult eyes.

The location of spaces and equipment, and how welcoming the outdoor area is for adults, along with the aesthetics were deemed to be highly influential on what children do. The provision of 'loose parts' helps children to make connections and to develop possibility thinking, advancing creative expression. Ease of access and indoor/outdoor flow was mentioned by many of the teachers in my research as a key factor that contributed to having an optimal outdoor environment.

The findings also highlighted that equipment placed in the environment must offer opportunities for gross motor skill development and other physical competencies to be practised and mastered, preferably natural challenges; as well as opportunity for decision making, problem solving, risk taking and socialising, sharing and collaboration.

It has become evident how a strong gardening culture is developing within New Zealand early childhood centres. Alongside this is the promotion of understanding sustainability and providing opportunities for children and their families to learn to care for, appreciate and respect Pāpatūānuku. This in turn not only fosters a sense of community, but reaches out into the community.

A 2017 study also highlighted the strong connection between children's wairua and the outdoors. Teachers identified that the environment had a clear role in nurturing a child's wairua when:

- There were good child-teacher ratios
- The layout of the space not was not cluttered;
- There were peaceful, quiet, stress-free spaces
- Culturally responsive resources
- Aesthetically pleasing and inviting spaces filled with nature and natural resources.

Indoor spaces

Very similar principles apply to indoor spaces. Children spending more than a few hours a day in non-parental care need an environment that has nurture and security as the first consideration. Hard surfaced, fluorescent-lit, classroom-like environments are not appropriate. There should be child-sized bounded spaces and soft furnishings, and adult-sized furniture to facilitate comfortable and intimate interactions with children.

Spaces that do not reflect a holistic approach, such as centre design that disconnects children from kitchen spaces, should be discouraged. This kind of design displays a lack of understanding of children's learning in the early years, and also removes children from quality of life aspects such as the smell and expectation of cooking. The design should reflect a social, home-like environment.

Design and environmental performance standards

New Zealand has no standard for indoor or outdoor ECE and care design, but the development of such a standard would be a considerable asset. The only current standard (recognised by the Ministry of Education as not enforceable), is *NZS 5828:2015 Playground equipment and surfacing.* This standard is derived from a UK/European standard for unsupervised playgrounds. It was clear in the scope statement of the source standard that it was not intended for supervised educational environments. NZS 5828 has three particular faults when applied to ECE environments:

- It is not designed for, and makes very little provision for, children under three years old.

- It assumes availability of sufficient space to use 360 degree separation distances between equipment, rather than other means such as fences or screening. In small spaces this approach can have serious consequences for use of space, including wasted space between equipment and boundary fences, and consequent opportunity cost.

- Requirements for engineers' reports are poorly defined, failing to distinguish between structures compliant with other legislation (e.g. NZS 3604) and structures that really do need engineering assessment.

No sensible parent would take their three year old to a playground for eight or ten hours a day, and few would think that a long day in a classroom environment was appropriate.

ECE outdoor areas are not playgrounds, and the indoor spaces are not classrooms. They are living and learning spaces for children from babies to pre-school age, with a very wide range of developmental, nurturing and learning needs. Indoor ECE and care spaces are daytime housing, and are unique in their design requirements.

Approximately 200,000 children every year deserve investment in a standard for their out-of-home facilities. For outdoor areas there is no need to 're-invent the wheel' – the knowledge base of NZS 5828 can be used to inform an appropriate standard.

Recommendations

1 Implement a phased, funded increase in indoor space per child to at least 3.25m^2, free of furniture, fixtures and fittings (Goal 1), or 3.5m^2 if furniture is included.

2 Implement a phased, funded increase in outdoor space to at least 7.0 m^2 per child, with a minimum 1/3 as grass and/or other natural play space intended for chid activities (Goal 1).

3 Develop a standard for early education and care facility design (Goal 1.4).

4 Indoor spaces should include genuine quiet spaces available at all times, and small-scale space where children can have a sense of enclosure, privacy and security.

5 Indoor spaces should include space for uninterrupted constructive play, where the product of a child's activity is not crowded or disrupted by other children accessing resources.

6 The Ministry of Education when licensing, and Education Review Office when monitoring, must share responsibility for the quality of indoor and outdoor spaces with early childhood teachers and centre management. This has been lacking in both licensing and ERO reviews.

7 The Ministry of Education and the Education Review Office must ensure that early childhood centres provide experiences and create outdoor spaces where children can build relationships of care for each other, other living beings, for the place itself and for spaces in the wider community. The must take responsibility to organise the environment in such a way that it invites cooperation, experimentation, responsibility and respect; ensuring that children have ease of access to the outdoors.

8 There must be a concerted effort for provision of optimal outdoor environments (physical settings plus wise adults) that will support the development of environmental competence, a love of nature, an understanding of and respect for Papatūānuku; a fascination for and wonder of how nature works; and an understanding that humans are dependent on nature.

9 To achieve this there needs to be across the sector a goal to seek harmony across pedagogical values, ensuring that the principles of Te Whāriki: He whariki māturanga mo ngā mokopuna o Aotearoa: Early childhood curriculum are upheld and then it follows that the outdoor environments the teachers create will respect children in a way that honours and facilitates their holistic development.

10 Everyone concerned must have a 'critical pedagogy of place; taking a critical appraisal of the purpose and value of their outdoor areas; and there needs to be a strengthening of self-review of outdoor play space.

References

1. Banning, W., & Sullivan, G. (2011). *Lens on outdoors learning*. St Paul, Mn.: Redleaf press.

2. Brownlee, P and Crisp, K. 2016. T*he sacred urge to play: Unfolding your child's intelligence, imagination, creativity and joy for life*. Thames, New Zealand: Good Egg Books.

3. Clark, A., & Moss, P. (2005). *Spaces to play: More listening to young children using the mosaic approach.* London, UK: National Children's Bureau.

4. Dudek, M. (Ed.), (2005). *Children's spaces.* London: Elsevier.

5. Greenfield, C. (2018). Investigation into New Zealand early childhood teachers' perspectives on spirituality and wairua in teaching. International Journal of Children's Spirituality, (Awaiting publication) https://doi.org/10.1080/1364436X.2018.1460333

6. Greenfield, C. (2017). Unleashing the power of play. Te Hono, The Link: Summer 2017, 12-13

7. Greenfield, C. (2015). Why did my children need to spend so much time outside? New Zealand Playcentre Journal, 152, Summer 2015, 25-26.

8. Greenfield, C. (2017) Investigation into New Zealand Early Childhood Teachers' Perspectives on Spirituality, Wairua and Teaching. Unpublished. Manukau Institute of Technology, Auckland, New Zealand.

9. Greenfield, C. (2013).So what does risk-taking and relationships in the outdoors have to do with each other? Christian Early Childhood Education Association of Aotearoa Magazine, Winter/Spring Edition.

10. Greenfield, C. (2012). Valuing the secret places: A sense of being away from adult gaze. In j Hansen, B Hagan, & L Howie (2012). Fresh provocations: Rethinking practices in early childhood education (pp.55-66). Auckland, New Zealand: Manukau Institute of Technology.

11. Greenfield, C. (2012). Fostering children's moral and spiritual development in the outdoors. Christian Early Childhood Association magazine, Summer edition, 11-14.

12. Greenfield, C.F. (2012). Characteristics of optimal early childhood centre outdoor environments: Spaces and places in which children and adults want to be. NZ Research in Early Childhood Education Journal, 15, 42-60 http://www.childforum.com/research/research-journal-articles-reviewed-ece/2012-nzrece-journal-articles/885-optimal-early-childhood-centre-outdoor-environments.html#ixzz2aZWbUYuC

13. Greenfield, C. (2010). Characteristics of Optimal Early Childhood Education Outdoor Environments. Auckland, New Zealand: Manukau Institute of Technology. ISBN: 978-0-473-18138-3.

14. Greenfield, C. (2011). What spaces and places create an optimal outdoor environment for children in early childhood settings? http://www.childforum.com/management/planning-a-developing-your-ec-service/356-optimal-outdoor-environment.html

15. Greenfield, C. (2011).Self –reviewing your outdoor environment. The Space for anything about early childhood. Issue 25, Spring 2011,33.

16. Greenfield, C. (2007). What is it about the monkey bars? Early Childhood Folio, 11:2007, 31-35.ISSN 01120053

17. Greenfield, C. (2007). Review of New Zealand Research on Outdoor Play in Early Childhood Education. Early Education, 41 (Autumn/Winter 2007), 24-29. ISSN 11729112

18. Greenfield, C. (2007). A case study of children's and adults' perceptions of 'being outside' in one early childhood centre. Unpublished Qualitative Masters of Education Thesis, Massey University, Palmerston North, New Zealand

19. Greenfield, C. (2004). Can run, play on bikes, jump the zoom slide, and play on the swings: Exploring the value of outdoor play. Australian Journal of Early Childhood, 29(2), 1-5.

20. Greenfield, C. (2003). Outdoor play - the case for risks and challenges in children's learning and development. Safekids News, 5.

21. Greenfield, C. (2003). The outdoor playground through children's eyes. Research Report to Manukau Institute of Technology (Unpublished).

22. Greenman, J. (2005). *Caring spaces, learning places: Environments that work*. Redmond, W.W: Exchange Press.

23. Gruenewald, D. (2003). The best of both worlds: a critical pedagogy of place. *Educational Researcher, 32*(4). http://www.pieducators.com/files/Critical-Pedagogy-of-Palce, pdf.

24. Organisation for Economic Cooperation and Development (OECD). Encouraging Quality in Early Childhood Education and Care (ECEC), International Comparison: Minimum Standards. 2011; Available from: http://www.oecd.org/education/school/48483436.pdf

25. Little,H., Wyver, S., & Gibson, F. (2011). The influence of play context and adult attitudes on young children's physical risk-taking during outdoor play. *European Early Childhood Education Research Journal*, 1991),113-131. Retrieved from http://dx.doi.otg/10.1080/1350293X.2011.548959

26. Louv, R. (2008). *Last child in the woods: Saving our children from nature-deficit disorder (Revised and updated ed.).* Chapel Hill, North Carolina: Algonquin Books of Chapel Hill.

27. McConaghy, R. (2008). Designing natural playspaces: Principles. In S. Eliot (ed). *The outdoor playspace naturally for children aged birth to five years.* Castlehill, NSW, Australia: Padmelon Press.

28. Park, B., Tsunetsugu, Y., Kasetani, T., Kagawa, T., and Miyazaki, Y. (2010). The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing); evidence from field experiments in 24 forests across Japan. *Environmental Health and Preventive Medicine*, 15(1): 18-26

29. Schein, D. (2018*). Inspiring wonder, awe and empathy: Spiritual development in young chidren*. St Paul, MN:Redleaf Press

30. Shin, W. 2015. Forest policy and forest healing in the Republic of Korea. I*nternational Society of Nature and Forest medicine,* October 2015.

31. Sobel, D. (1990). A place in the world: Adults memories of childhood's special places. *Children's Environments Quarterly, 7*(4), 5-13.

32. Stephenson, A. (1998). *Opening up the outdoors: A reappraisal of young children's outdoor experiences* Unpublished Qualitative Thesis, Victoria University, Wellington.

33. Tovey, H. (2007). Playing Outdoors: Spaces and places, risks and challenges. Berkshire, England:Open University Press.

34. Young, T. (2008). Creating specific features to foster nature connections. In S. Elliot (Ed.), *The outdoor playspace naturally for children birth to five years.* Castlehill, NSW: Pademelon Press.

Detail Section Four

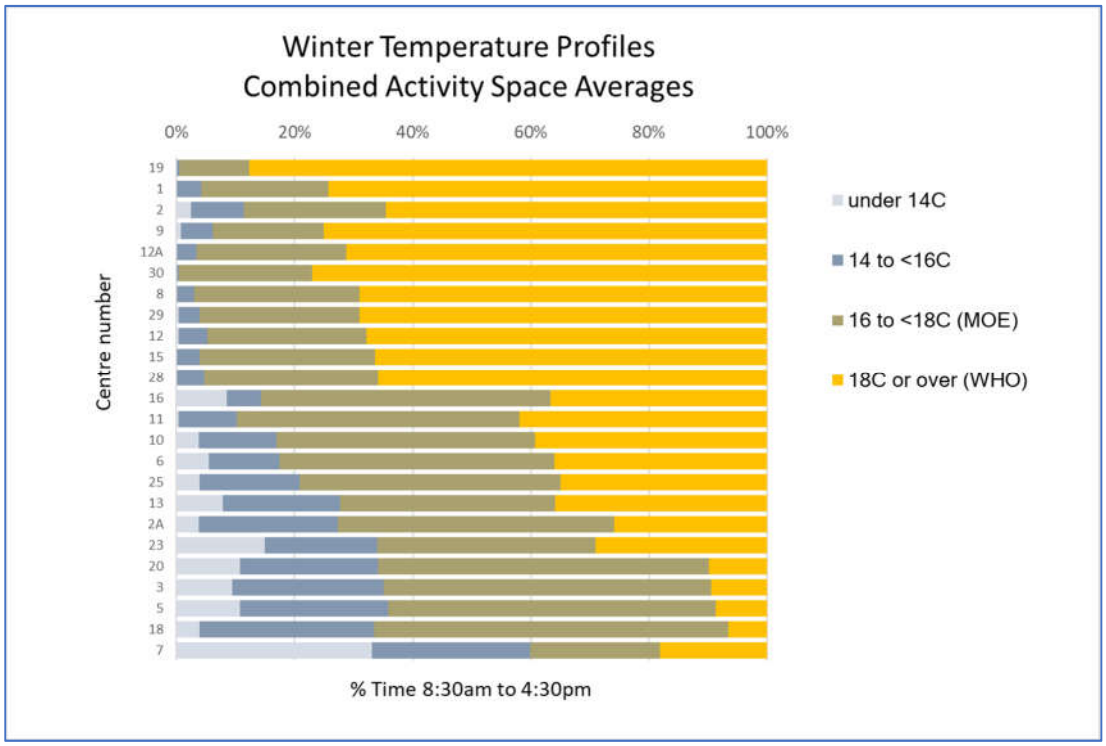
Heating, ventilation and air quality

Mike Bedford

The Early Childhood Education Environments (ECEE) study in 2017 revealed serious problems with temperatures and ventilation in a cohort of full day childcare centres in the Hutt Valley and northern suburbs of Wellington.

Temperatures

The study showed that 90% of the centres were having difficulty meeting the minimum temperature of 16°C during winter. The winter results are shown below. In this graph the blue bands represent time below 16°C. Nine centres were below 16°C for more than 20% of the time, and one was below more than 60% of the time. The measurements were taken during activity times at 15-minute intervals. These measurements were taken at least 1 hour after opening time, except for one centre (No. 16) which was from half an hour after opening.



The study also found a significant reduction in child sick days with increased temperatures in the mid to upper teens °C. For each degree increase in the median winter indoor temperatures, risk was reduced by 23%, RR = 0.770 (95% CI: 0.609 to 0.974). The association was significant across the second and third quartile temperature ranges, which were from 15.2°C to 20.8°C. For each percentage point of time spent under 18°C, risk of children being away sick increased 1.3% (95% CI:

0.3% to 2.2%). The modelling controlled for minimum space per child, as well as the following extraneous variables with significant effect: mould in the child's home, ethnicity, use of a Community Services Card, child age and attendance at an ECE service before two years of age.

The results of an English language Google search for relevant statutes and/or recommendations for minimum temperatures in ECE and care are shown below. The search found just one recommendation or requirement below 18°C, other than the New Zealand legal minimum of 16°C, which was Minnesota State at 16.7°C.

Jurisdictions or recommendations	Minimum temperatures
10 US states	20
3 Canadian states	20
National Resource Centre for Health and Safety in Child Care and Early Education (United States)	20
2 US states	19.4
12 US states	18.3
Illinois	18.3 / 20
Ireland	18
Isle of Man	18
World Health Organisation - home / workplace	18
New Zealand 1990-98	18
Minnesota	16.7
New Zealand 1998-current	**16**
2 US states	Not found
4 Canadian States	Not found
UK - national standards	None
Australia	None

The *WHO Housing and Health Guidelines 2018*[1] and the recently released New Zealand *Healthy Homes Standards* [2] both recommend a minimum temperature for housing of 18°C. Full day ECE and care is effectively daytime housing for children, and should be treated as such with regard to minimum temperatures.

Viral survival

While infectious organisms in an ECE centre will include bacteria, protozoa, viruses and fungi, it is likely that viruses are the group of infectious agents responsible for most infections in these environments, and that factors affecting viral, rather than bacterial survival may be the most important. This view is supported by the predominance of short-term respiratory infections in the ECEE study, the findings in a Turkish study that 44.4% of the childhood gastroenteritis cases were viral [3], and in a Dutch study that the four most common organisms detected in their surveillance were norovirus, rotavirus, G. lamblia, and astrovirus [4]. Another study found that in temperatures over the range of 19°C to 25°C, viral infectivity decreases exponentially with increasing temperatures [5].

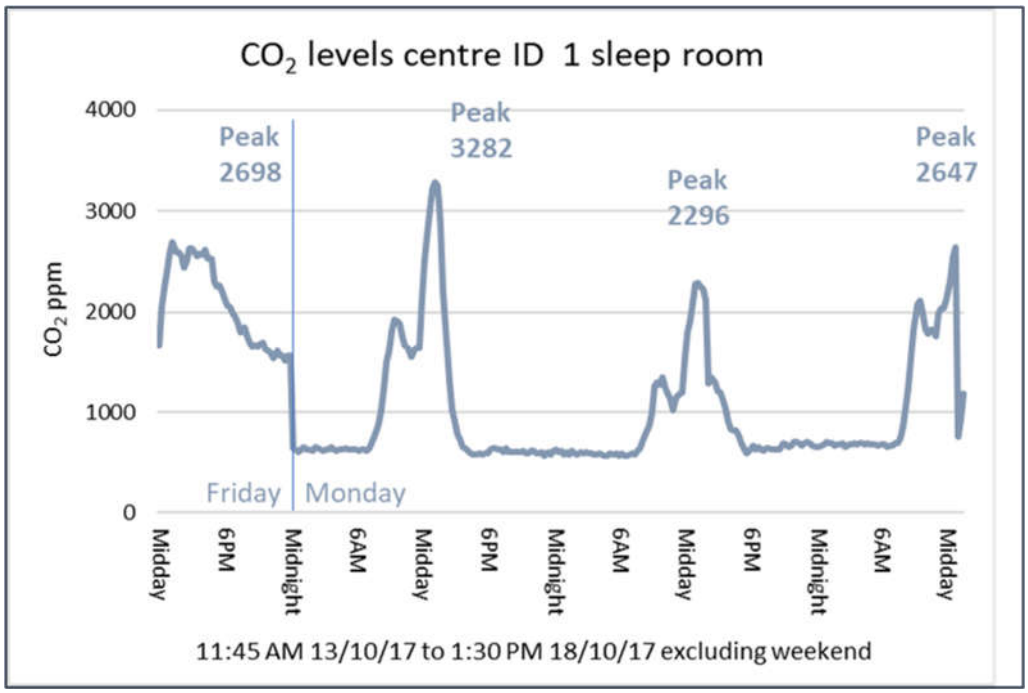
The survival of viruses (and protozoan cysts such as Giardia) follow a completely different pattern to bacteria. While bacteria grow in the environment, and will do so faster with warmer temperatures, viruses and protozoan cysts only grow inside a suitable host. While waiting on surfaces in the environment, they will survive longer if it is cooler.

It is unlikely that the centres wanted these cold temperatures (and these were the centres that agreed to have their temperatures monitored), but little research has been done into effective heating systems in New Zealand ECE environments. Most of the heating systems in use were heat pumps, and it was clear that some were poorly located, for example, right next to an outside door, or at the end of a long room.

There is a need to research better heating systems, possibly including infrared and air curtains.

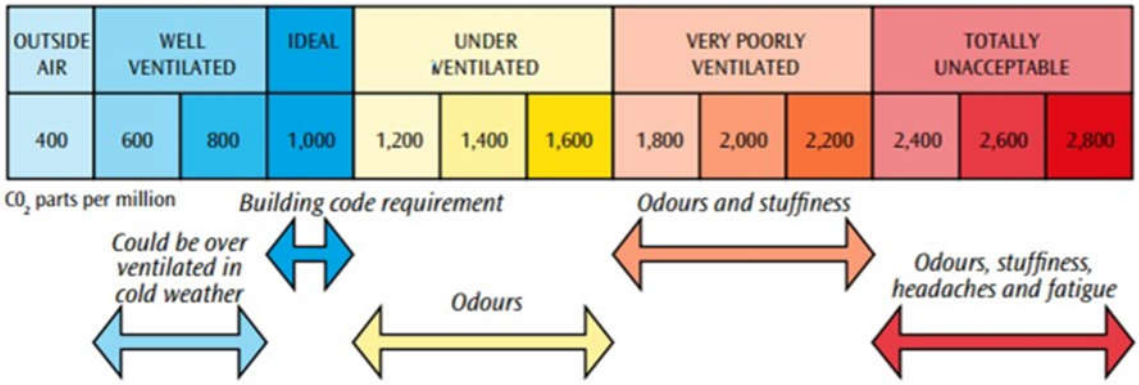
Ventilation

The ECEE study also found serious problems with ventilation in sleep rooms (and one under two's activity space), measured as peak CO_2 levels. In an ECE centre, increased CO_2 comes from human breathing, and is a good proxy for ventilation. CO_2 measurements were taken in 13 sleep rooms, and showed some very high levels while sleep rooms were in use. Six sleep rooms had levels exceeding 3,000ppm, with the highest level being 3,792ppm. Another two exceeded 2,000ppm. Only one had levels consistently below the recommended maximum of 1,000ppm.



These levels are in the range described by BRANZ as 'totally unacceptable', as shown in the table on the next page.

Carbon dioxide as an indicator of school classroom ventilation, reproduced from *Designing Quality Learning Spaces: Ventilation & Indoor Air Quality (BRANZ)* [6].



A study by the US Department of Energy's Lawrence Berkeley National Laboratory found that:

> On nine scales of decision-making performance, test subjects showed significant reductions on six of the scales at CO_2 levels of 1,000 parts per million (ppm) and large reductions on seven of the scales at 2,500 ppm. The most dramatic declines in performance, in which subjects were rated as "dysfunctional," were for taking initiative and thinking strategically [7].

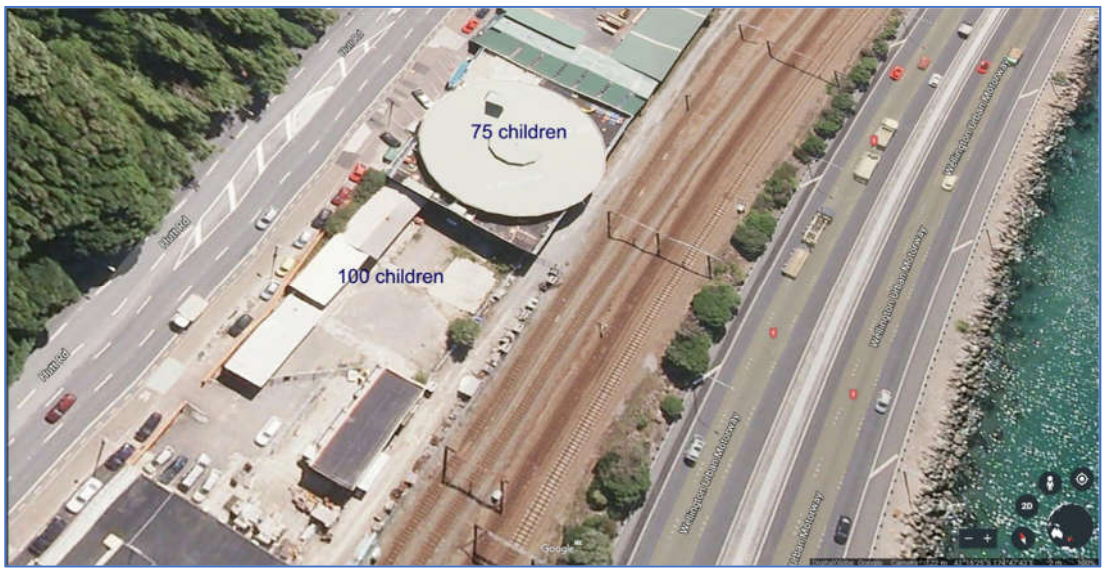
Studies have also shown an association between higher indoor CO_2 concentration and wheezing in children [8], and also between poor ventilation increased concentrations of bacteria [9], and between poor ventilation rates and child illness rates [10].

During the ECEE study sleep rooms and activity spaces were seen with no ventilation at all. The only ventilation available was the opening of windows, but the windows were closed. Some sleep rooms had no windows. This indicates that for children's health, ECE environments, and especially sleep rooms, need effective and automatic ventilation.

Air quality and centre location

There has been an increasing trend for ECE services to be located in commercial and industrial zones, or next to busy roads or intersections. This trend is driven in part by Resource Consent issues, and in part by the commercial advantage in the siting of centres on commuter routes. Two examples of this can be seen on the next page.

The Google Earth photo below shoes the location of two ECE centres in a commercial / industrial zones sandwiched between a motorway, railway line and another busy road.



The next photo shows a centre on the corner of an intersection that experiences up to 1,000 vehicle-an-hour traffic, braking and accelerating on the bend, or accelerating from a carpark (behind the camera). The play area in this view is for the under twos, for whom every surface is a contact surface.

There is increasing evidence that particulate air pollutants, such as diesel exhaust particles, are associated with chronic inflammatory processes and illness of the respiratory tract [11, 12]. Exposure to volatile organic compounds is related to immunologic, respiratory, and carcinogenic health effects [13]. Short-term increases in 2.5 micron particulates ($PM_{2.5}$) and 10 micron particulates (PM_{10}) and

ozone have been associated with airway inflammation for school-age children independent of asthma and allergy status [14].

Potential mechanisms by which polyaromatic hydrocarbons (PAHs) or $PM_{2.5}$ may increase lower respiratory tract illnesses include oxidative stress, structural damage, efficient transport of pathogenic microbes, and immune dysregulation. PAH constituents of diesel exhaust particles catalytically generate reactive oxygen species, causing stress to biological systems [15]. Strong associations have been found between increased levels of PAHs and lower respiratory tract illnesses, especially bronchitis, in children between birth and four and a half years of age.

Very young children are particularly at risk from exposure to pollutants, having a higher metabolic rate and oxygen consumption than adults, and consequently greater intake of air per unit body weight [14, 16]. In addition to these factors, lung growth and development, and incomplete metabolic systems, can lead to higher exposure to higher doses of pollutants reaching the lungs. Aspects of body detoxification systems may increase the effects of this exposure [17].

Licensing of unsuitable locations

The Ministry of Education has long been aware of the dangers of air pollution, but has continued to licence centres in places that clearly flout its own guidelines, such as the 100-child centre shown in the top photo. Perhaps in bad taste humour, both centres are described by ERO as 'well placed'. ERO did not include the location or outdoor areas in its reviews.

The Ministry of Education's own website states:

Air pollution and the location of services

Because vehicles cause a lot of pollution, there may be more risk from air pollution if your ECE service is located:

- *within 5 metres of a busy intersection or a busy area*
- *within 20 metres of a busy road*
- *within 100 metres of a motorway*

other places with a high risk of air pollution are:

- *near a railway or industrial area*
- *underneath an airport flight path*
- *near land that has been contaminated, for example, by industry or horticulture*
- *near petrol stations or services like spray painters.*

The Ministry of Education needs to immediately stop the licensing of new centres in locations such as the ones shown on the previous page (by urgent regulation amendment if necessary), and consider phasing out existing licences for centres in locations such as these. Another consideration for centres such as those in the top photograph is the lack of access to any green space. For two reasons these centres should not have been developed in this location.

Full day ECE centres should provide safe access to other environments, without requiring vehicles to get there. There is a need for footpath access to other spaces – parks, residential or shopping areas,

as they are part of children's life experience and learning. The location of the centres illustrated in the top photo do not allow for safe excursions without use of vehicles.

Recommendations

1 Increase the minimum indoor temperature requirement to 18°C (Goal 1).

2 Put an immediate stop to the licensing of centres with no green space, or in locations within 20 metres of a busy road or busy intersection within 100 metres of a motorway, or in other places with a high risk of air pollution such as near railway or industrial area, near land that has been contaminated, for example, by industry or horticulture, or near petrol stations or services like spray painters (Goal 1).

3 Investigate and implement remote monitoring systems for temperature and CO_2 levels, with alerts for centre staff (Goal 1.7).

4 Actively enforce performance-based heating and ventilation requirements. The responsibility lies with the centre management to implement effective technology for these performance standards (Goal 1.7).

5 Actively fund and support research into effective technologies for the heating and ventilation of ECE environments (to support Recommendation 3 above) (Goal 1.4).

6 Develop measurable requirements for indoor CO^2 levels, especially for sleep rooms, as a proxy indicator for ventilation (Goal 1.4).

7 Support research into outdoor air quality, surface contamination and centre location, especially in relation to roads and industrial areas (Goal 1.4).

8 Develop an environmental standard for education and care services, for application to Resource Consent processes (Goal 1.4).

References

1. World Health Organisation. *WHO Housing and health guidelines*. 2018 [24/2/19]. Available from: https://apps.who.int/iris/bitstream/handle/10665/276001/9789241550376-eng.pdf?ua=1

2. Ministry of Housing and Urban Development. *Healthy homes standards*. 2019 [25/2/19]. Available from: https://www.hud.govt.nz/residential-housing/healthy-rental-homes/healthy-homes-standards/

3. Özdemir, S.D., N.; Emekdaş, G., *Investigation of rotavirus, adenovirus and astrovirus frequencies in children with acute gastroenteritis and evaluation of epidemiological features.* Mikrobiyoloji Bulteni, 2010. **44**(4): p. 571-578.

4. Enserink, R., et al., *Risk factors for gastroenteritis in child day care.* Epidemiology and Infection, 2015. **143**(13): p. 2707-2720. https://dx.doi.org/10.1017/S0950268814003367

5. Prussin, A.J., II, et al., *Survival of the enveloped virus Phi6 in droplets as a function of relative humidity, absolute humidity, and temperature.* Applied and Environmental Microbiology, 2018. **84**(12). https://dx.doi.org/10.1128/AEM.00551-18

6. BRANZ. *Designing quality learning spaces: Ventilation and indoor air quality*. 2007; Available from: https://www.education.govt.nz/assets/Documents/Primary-Secondary/Property/School-property-design/Flexible-learning-spaces/VentilationIndoorAirQualityGuide.pdf

7. Chao, J. *Elevated Indoor Carbon Dioxide Impairs Decision-Making Performance*. News Center 2012; Available from: https://newscenter.lbl.gov/2012/10/17/elevated-indoor-carbon-dioxide-impairs-decision-making-performance/

8. Carreiro-Martins, P.V., J.; Papoila, A. L.; Aelenei, D.; Caires, I.; Araújo-Martins, J.; Gaspar-Marques, J.; Cano, M. M.; Mendes, A. S.; Virella, D.; Rosado-Pinto, J.; Leiria-Pinto, P.; Annesi-Maesano, I.; Neuparth, N., *CO2 concentration in day care centres is related to wheezing in attending children.* European Journal of Pediatrics, 2014. **173**(8): p. 1041-1049. https://dx.doi.org/10.1007/s00431-014-2288-4

9. Mendes, A., et al., *Environmental and ventilation assessment in child day care centers in Porto: The envirh project.* Journal of Toxicology and Environmental Health - Part A: Current Issues, 2014. **77**(14-16): p. 931-943. https://dx.doi.org/10.1080/15287394.2014.911134

10. Kolarik, B.J.A., Z; Ibfelt, T; Hoj Engelund,E; Møller, E; Vaclavik Br€auner, E., *Ventilation in day care centers and sick leave among nursery; children.* Indoor Air, 2015. https://dx.doi.org/10.1111/ina.12202

11. Hiura, T.S., et al., *Chemicals in diesel exhaust particles generate reactive oxygen radicals and induce apoptosis in macrophages.* Journal of Immunology, 1999. **163**(10): p. 5582-5591.

12. Liu, Q.X., C.; Ji, G.; Liu, H.; Shao, W.; Zhang, C.; Gu, A.; Zhao, P., *Effect of exposure to ambient PM2.5 pollution on the risk of respiratory tract diseases: A meta-analysis of cohort studies.* Journal of Biomedical Research, 2017. **31**(2): p. 130-142. https://dx.doi.org/10.7555/JBR.31.20160071.

13. Carreiro-Martins, P.P., A. L.; Caires, I.; Azevedo, S.; Cano, M. M.; Virella, D.; Leiria-Pinto, P.; Teixeira, J. P.; Rosado-Pinto, J.; Annesi-Maesano, I.; Neuparth, N., *Effect of indoor air quality of day care centers in children with different predisposition for asthma.* Pediatric Allergy and Immunology, 2016. **27**(3): p. 299-306. https://dx.doi.org/10.1111/pai.12521

14. Berhane, K.Z., Y.; Linn, W. S.; Rappaport, E. B.; Bastain, T. M.; Salam, M. T.; Islam, T.; Lurmann, F.; Gilliland, F. D., *The effect of ambient air pollution on exhaled nitric oxide in the children's health study.* European Respiratory Journal, 2011. **37**(5): p. 1029-1036. https://dx.doi.org/10.1183/09031936.00081410

15. Hertz-Picciotto, I.B., R. J.; Yap, P. S.; Dostál, M.; Joad, J. P.; Lipsett, M.; Greenfield, T.; Herr, C. E. W.; Beneš, I.; Shumway, R. H.; Pinkerton, K. E.; Šrám, R., *Early childhood lower respiratory illness and air pollution.* Environmental Health Perspectives, 2007. **115**(10): p. 1510-1518. https://dx.doi.org/10.1289/ehp.9617

16. Lyne, M., *Exposure Asessment of Traffic-Related PM10 Pollution in Outdoor Play Areas of Early Childhood Centres*, in *School of Applied Sciences*. 2008, Auckland University of Technology.

17. World Health Organisation *Effects of air pollution on children's health and development - a review of the evidence*. 2012.Available from: http://www.euro.who.int/__data/assets/pdf_file/0010/74728/E86575.pdf

Detail Section Five

Noise

Wyatt Page and Susan Bates

Health effects of noise

The health effects of noise dependent on how loud (the sound pressure level) the sound is, how long (time) someone is exposed, the frequency content of the sound and the emotional and health status of the individual. The last two elements, *emotional and health status* are not generally considered in any standard or regulations for noise, as these relate to an individual and not a population. This means that the health effects of the same noise on an individual can vary significantly from day-to-day and time of day. If someone is unwell, in pain, or has a compromised immune system, they are more adversely affected by a range of stimuli, including noise. This also applies to certain vulnerable groups, such and children, the elderly and pregnant woman.

The adverse health effects of noise are broad, and include: annoyance; learning/development delay (in children); hearing loss; increased risk of cardiovascular disease; sleep disturbance and the cascade of health effect associated with poor sleep; stress; depression; increased accidents and hospital admissions; and reduction quality of life and life span [1].

Sound levels are commonly measured in decibels (dB) (using A-frequency weighing) and time-averaged over the measurement period ($L_{Aeq,T}$). An increase of 3dBA anywhere along this scale is a doubling of the noise exposure. Normal conversation is about 60 dB(A). An optimum range in ECE and care environments has been found to be 60-65dBA for the best emotional wellbeing in children [2]. Levels above 75 dB start to become a concern for potential hearing damage in adults. New Zealand (and many countries) use a workplace noise limit of 85 dB for an 8-hour working day ($L_{Aeq,8h}$) for hearing protection. Adverse health effects can start at much lower levels for babies and very young children; 35 dB at night while sleeping and 45-50 dB during the day. Various reports show ECE centres regularly exceed 90 dB with maximum levels often over 100 dB, posing significant risk to children (and teachers) from hearing loss, cognitive develop delay and a wide range of other health issues.

Noise as an issue for health and education

Excessive noise is a health issue and is implicated in a range of physical conditions for children and adults that go beyond potential hearing damage. It is a factor in environmental chaos which has been shown to be detrimental to child development, and to psychological health of everyone [1].

Children's language learning suffers in noisy environments. Hearing and observing foundational language inputs may be seriously disadvantaged. There is little research into the development of audio-neural pathways in children.

Children (and adults) sensitive to noise, those on the autism spectrum, with hearing and language difficulties, those for whom English is a second language will struggle in noisy environments.

Teachers and children are covered by the Health and Safety at Work Act 2015, but results above show that these the Act is not being enforced in ECE environments.

There are no specific limits for the safety of children. The default is to use the adult workplace criteria, which for infants and young children in particular, is very likely to be excessive. Neither are there any clear and measurable limits set for ECE environments in the Education (Early Childhood Services) Regulations 2008 that reflect the comfort levels in the environment.

Noise levels in New Zealand ECE Centres

There only one detailed study that has been carried out on noise in New Zealand ECE centres, where actual noise measurement were taken. Stuart McLaren [3] published a comprehensive study of noise in early childhood education centres, measuring general noise levels, individual noise exposure of both staff and children and assessing the acoustical quality of the centres. This data was collected from a large number of ECE centres between 2002-2006. As well as the quantitative noise measurements, McLaren included observational results and some results from the surveying the staff about noise.

From the observational work, McLaren concluded that most children are affected in some way by noise. And that those most at-risk include: those with Autism spectrum disorder (ASD) and Asperger's syndrome; a subset of the gifted; those with hearing impairment or other auditory processing disorders; as well as a range of other specific conditions including Down syndrome.

At the time of the study, most ECE centres were sessional, operating a morning and/or afternoon session, where children typically attended only one of the sessions, for 2-3 hours of the day. A reasonable number of 'All-day' centres were included in the study, where children spent 6-8 hours of the day at the centre.

General sound pressure levels indoor in the centres while operating range from 65 – 79 dB ($L_{Aeq,\ 6\text{-}8h}$) for 'all-day' centres and 70 – 75 dB ($L_{Aeq,\ 2\text{-}3.5h}$) for sessional centres. In all cases the levels were well above conversational level (60 dB L_{Aeq}), implying that both staff and children would need to significantly raise their voice to be heard.

Personal sound exposure meters were attached to staff to measure their actual noise exposure while carrying out their duties in the centres over a working day. Measurements from 80 staff (49 from all-day centres; 31 from sessional centres) where collected. The New Zealand workplace noise criteria were used to assess their exposure. The time-average 85 dB for 8-hours limit ($L_{Aeq,8h}$) can be expressed as a noise-dose of 100%. McLaren divided the noise assessment into three percentage noise-dose categories:

1. < 50%
2. 50 – 100%
3. 100%

As well as measuring noise exposure, any exceedances of the workplace noise criteria for peak noise of 140 dB (L_{CPeak}) were recorded. The results are shown below.

Personal sound exposure meters were also attached to children to measure their noise exposure while at the centres over the time of their session. Measurements from 191 children (61 from all-day centres and 130 from sessional centres) where collected. The results are shown below.

Daily sound exposure for children

Adult workplace criteria was used when assessing the children's exposure even though this is likely to be excessive. There reason for using this criterion is that there was and still is, no agreed criteria for children's noise exposure, with most jurisdictions defaulting to using the adult criteria, even though it likely to be inappropriate. Peak exceedances were not included in the data from McLaren for children, due to concerns around their reliability.

Sound exposure for children

Daily sound exposure (% dose)	All-day centres 61 in total (% of total)	Sessional centres 130 in total (% of total)	Total (both) 191 (% of total)
1. <50%	19 (31%)	82 (63%)	101 (52%)
2. 50-100%	16 (26%)	24 (18.5%)	40 (22%)
3. >100%	26 (43%)	24 (18.5%)	50 (26%)

Over a quarter (26%) of all the children received a noise dose greater than 100%. For sessional centres, 18% of children exceed 100% dose, while for all-day centres close to half of all children (43%) exceeded this adult criteria designed to protect hearing.

The main reason for the much higher percent in all-day centres simply comes down to them being at the centre 2-3 times longer than their sessional counterparts. If a child's exposure is 50% after spending 3-hours at a centre, then it will be 100% after spending 6-hours at a centre. The longer the time of exposure, the greater the noise dose. To limit the exposure to 50% after 6 hours, the sound pressure level must drop by 3 dB (or more) for the whole session.

Daily sound exposure and peak level exceedances for staff

The daily noise dose exceeded 100% in 11% of the centres, 89% of these were All-day centres. Implying that a significant portion of centres were noncompliant with the workplace regulations for noise, the majority being All-day centres. The workplace peak limit was exceeded in 38% of the centres, 63% of these were All-day centres. These peak exceedances typically occurred when things crashed to the floor, doors were slammed, or chairs legs were dragged on the floor.

Sound exposure for adults

Daily sound exposure (% dose)	All-day centres 48 in total (% of total)	Sessional centres 31 in total (% of total)	Total (both) 79 (% of total)
1. <50%	31 (69%)	25 (82%)	56 (71%)
2. 50-100%	9 (20%)	5 (14%)	14 (18%)
3. >100%	8 (11.0%)	1 (4%)	9 (11%)
Peak level exceedances	19 (40%)	11 (35%)	30 (38%)

It is important to recognise that children and teachers are being exposed to noise levels that will damage hearing. This is far, far above comfort levels and any reasonable level for a living and learning environment.

Acoustic quality of ECE spaces

An important factor in mitigation of noise in spaces is the acoustic quality of the space. This is typically measured using the reverberation time (T60), which is the time it takes for a loud sound to die away (decrease by 60 dB) to inaudibility. The more quickly the sound dies away, the more the space absorbs the sound, helping to control the sound level when the space is occupied.

The current joint Australian /New Zealand standard AS/NZS 2107:2016 for classrooms and learning spaces and the Ministry of Education and BRANZ jointly developed '*Designing Quality Learning Spaces (DQLS) v2.0 2016* [4], both specify the desirable reverberation time as 0.4 - 0.6 seconds. With guidance that, for at-risk children (those with speech, hearing and auditory processing impairments, etc.) and for language activities such as speech language therapy, a value of 0.4 seconds is recommended.

McLaren (2008) measured the reverberation time (mid-frequency) for in 41 ECE learning spaces, including one purpose-built centre. The majority of centres at the time were converted residential houses or other premises.

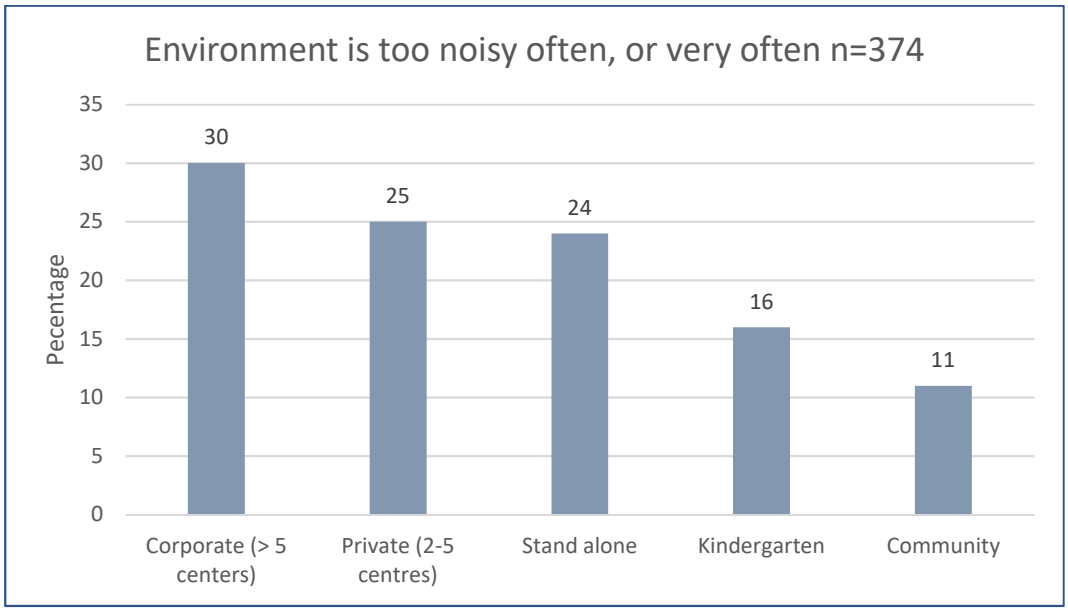
Only 39% of the centres had a reverberation time in the recommended range, with two centres (including the purpose built one) showing a value less than 0.4 seconds. The vast majority exceed 0.7 seconds with 12% exceeding 0.8 seconds.

This lack of effective noise control from the surfaces of these learning spaces is likely to mean that when occupied and operational, the noise levels will be significantly higher than for an equivalent space with good acoustic treatment.

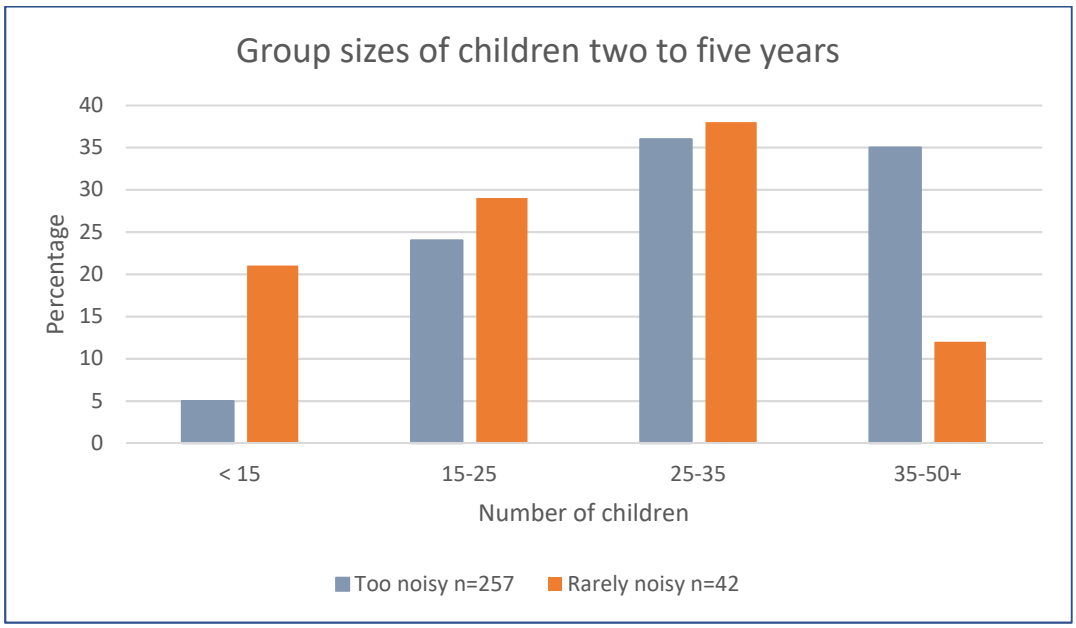
he noise exposure of children in ECE centres is likely to be worse today than when McLaren did his comprehensive study over 11 years ago. The majority of children in ECE care in New Zealand are now in all-day centres, where 'all-day' can often mean longer than 8-hours. These all-day centres also tend to be much larger with many more children in contiguous spaces, than the centres from the early 2000s. More children means higher noise levels and greater noise exposure for both staff and children, and thus more adverse health effects.

Survey - Teacher/Carer Health, Safety and Well-being

A 72 question survey was conducted through social media in 2017-2018 and contained both qualitative and quantitative data. There were 706 respondents. The survey had approval from Ethics NZ. 374 (53%) of respondents reported that their workplaces were too noisy. There is some indication the environment makes a difference.



68% of the teachers in the survey worked with children two years to five years old. The minimum ratio for these groups is one adult to 10 children. Where the minimum ratios are commonly employed, the noise levels rise. Of those in excessively noisy environments in this age group, 50% are working at ratios of 1:10 or more. My own experience (Susan Bates) as a relieving teacher in many ECE and care centres is consistent with that of Child Forum research [5], in which 12% of teachers reported working at less than legal teacher child:ratios. I had many experiences of being left with greater than the legal number of children.



For teachers in infant and toddler rooms, (149) only 17 (11%) reported their rooms were never or rarely too noisy. 74 (50%) reported their room was too noisy often or very often.

Noise was often mentioned as a source of stress for teachers, affecting their patience an increased likelihood they would 'snap' at children, or just withdraw in order to protect themselves.

"It's so noisy I can't hear my brain"

This was part a conversation with a child at Wellington Public Library, 2017. It was not a conversation about noise, the comment was unprompted.

Do you like your day care?

Sometimes I cry.

Why?

Because … it's …. It's so noisy I can't hear my brain.

Observation from Susan Bates

I have been in many centres, where, especially at mat times, children are sitting with their hands over their ears. They move their play areas as far from speakers as they can get, sometimes to doorways, but of course they are moved out of them. Children on the autism spectrum are constantly upset. I have observed that some children's normal speaking voice has become shouting at all times because that is what they have had to develop in order to be heard.

The Lombard effect and group size

Group size is also a crucial factor. There are tipping points around 15-25 children, and over 35 children. Smaller groups (<15) were much better, while large groups (>35) were much worse.

The Lombard Effect, that describes the positive feedback loop of conversation volume in a constrained space, applies in childcare [6,7]. Children and teachers need to raise their voices to overcome background noise, which in turn increases volume. Crying children, especially crying babies, will exacerbate the situation.

Although there a need for more research into group size in centre-based care and noise, this effect would suggest that smaller group size, apart from acoustic treatments to a room, would reduce noise levels.

Recommendations

1 Limit group size to reduce the sound loading in children's spaces.

2 Limit average sound pressure level when operational to 65 dB LAeq

3 Ensure that all centres have appropriate acoustic treatment so that the reverberation time is in the range 0.4 - 0.6 seconds or lower

4 Investigate and implement remote monitoring systems for noise levels, with alerts for centre staff (Goal 1.7).

5 Implement teacher training in noise management – this should include

   a. use of quiet 'inside' voices

   b. setting appropriate group sizes

   c. use of pads and similar sound damping on furniture and percussive instruments and carpentry to reduce the noise produced while preserving the enjoyment.

References

1. Werner, C.D., et al., *Noise in center-based child care: Associations with quality of care and child emotional wellbeing.* Journal of Environmental Psychology, 2015. **42**: p. 190-201. https://doi.org/10.1016/j.jenvp.2015.05.0032.

2. Basner, M., et al., Auditory and non-auditory effects of noise on health. The Lancet, 2014. 383(9925): p. 1325-1332. 10.1016/S0140-6736(13)61613-X.

3. McLaren, S.J., Noise in early childhood education centres: the effects on the children and their teachers. Massey University 2008. PhD thesis. https://mro.massey.ac.nz/handle/10179/977

4. Ministry of Education, *Designing quality learning spaces.* http://www.education.govt.nz/school/property/state-schools/design-standards/flexible-learning-spaces/designing-quality-learning-spaces/

5. https://www.childforum.com/education/research-evidence-and-survey-results/surveys-and-ece-sector-a-family-data/1323-quality-report-teachers-views.html .

6. Kawai, K. *Effect of sound absorption on indoor sound environment of nursery school classrooms*. in 20th International Congress on Acoustics 2010, ICA 2010 - Incorporating Proceedings of the 2010 Annual Conference of the Australian Acoustical Society. 2010. Available from: https://www.scopus.com/inward/record.uri?eid=2-s2.0-84869119638&partnerID=40&md5=aa89e86efadbbb169821b86de7226342.

7. Wikipedia. Lombard effect. 2018 [30/11/18]. Available from: https://en.wikipedia.org/wiki/Lombard_effect.

Detail Section Six

Nutrition and active movement

Sarah Gerritsen

Early childhood is widely regarded as the ideal time to develop behaviours that assist with lifelong healthy eating and physical activity patterns. Eating and activity habits, and food preferences, are becoming established in the preschool years, and early childhood is characterised by 'high plasticity' and 'rapid transitions' that assist with behavioural change [1].

For children with less-than-optimal home nutrition environments, out-of-home childcare may serve as a 'protective' environment, ameliorating or buffering preferences and behaviours learned at home [2], but only if the food and nutrition behaviours in the out-of-home environment are health-promoting. Healthy environments in early education can inspire and support parental efforts to provide healthy food and activity opportunities, and encourage change in societal norms around eating and movement more generally [3].

It is also reasonable to assume that if the nutrition provided in ECCE and care is not high quality, children may experience negative effects, especially if the meals constitute their main weekday diet, and/or their home nutrition is less than optimum.

Menus

Just over half (56%) of all ECE services in Auckland and Waikato in 2014 were providing some food to children daily; including two-thirds of private childcare centres, one-third of community childcare centres and a few public kindergartens, who provided lunch daily [4]. Some ECE service managers reported that they would prefer to provide all the food for a child's day rather than have lunchboxes and food brought in on special occasions, as they are concerned about the quality of food children receive from home [4].

Unfortunately, an analysis of 57 weekly menus (with lunch and two or more snacks for 5 days) from early childhood education centres in the Auckland and Waikato areas, found only 5% met all ten Ministry of Health nutrition guidelines (mean with a mean score of 6.8 out of 10) [5]. It's important to remember that these were centres that agreed to take part in a study.

This meant that very few menus contained foods of sufficient quantity, variety and quality to meet half of a pre-schooler's nutritional needs, when assessed using criteria in the Ministry of Health's guidelines.

A higher menu score was statistically associated with: employing a cook; high and low (but not medium) neighbourhood household deprivation; and participation in the Heart Foundation's Healthy Heart Award programme. Higher menu scores were not associated with the amount of money spent on food (centres reported the cost of food per child per day).

Cooks in ECE and care

Cooks were generally employed 30 or more hours a week (n=49; 62.0%) or 20–30 hours a week (n=26; 32.9%).

- 50% of cooks (40) had an NZQA approved certificate in food safety/hygiene or food service.
- A further 30% cooks (24) had a basic food safety/hygiene diploma or certificate.
- 15% of cooks (12) had attended a menu development course run by the Heart Foundation, and 2.5% (2) had another form of nutrition training.
- 16.3% (13) did not have any food safety or nutrition training.

Assistance with for improving and monitoring menus centres could be provided via an online menu tool, similar to that currently being evaluated in Australia [13].

Food and nutrition policies

The existence of a policy does not necessarily mean that the policy is sufficiently-worded, or that it is effectively implemented. Over 80% of ECE and care services surveyed in Auckland and Waikato had a written healthy food or nutrition policy in 2014, but policies were not comprehensive or strongly-worded when compared with policies in similar studies in the US and Australia [4]. The overall scores for comprehensiveness and strength of written nutrition policies of all services were exceptionally low; even the most comprehensive policy only scored 65/100, and the most strongly-worded policy scored 39/100.

Policies would benefit from an additional statement that food provided by the service and/or brought into the service from home will meet the Ministry of Health's Nutrition Guidelines (2012), and also by including specific directives for staff to follow recommended practices in the ECE and care setting (as listed in Gerritsen 2016 [6]), to create an environment that enables children to develop healthy preferences and to encourage families to reassess existing unhealthy preferences [7].

An umbrella review of international systematic reviews found that modifying ECE centre nutrition policies and menus so that they were consistent with dietary guidelines would improve children's diets [9]. As the proportion of young children attending ECE and care reaches near-universal levels, it is imperative that the food provided to children in these services is adequately monitored [8].

Long term effects of good nutrition in ECE and care – helping children to develop a positive relationship with food

It has been shown that the ECE and care environment can positively affect both children's consumption of healthy foods [10], and desirable eating behaviours [11]. Positive changes in young children's eating behaviours occur when early childhood teachers engage in mealtime practices that promote interest, enjoyment and self-regulation such as sitting with the children to eat, having conversations while eating, and asking a child if they are still hungry when offering more food).

Environments that engage children with food, for example the kitchen being connected to the activity space, opportunities for children to help with food service, and on-site growing of vegetables and fruit, should be actively promoted by the Ministry of Education.

For children who do not experience healthy eating behaviours at home, the ECE and care environment may offer them a second opportunity to learn these important life skills. It is a commonly expressed frustration of early education staff, including in NZ, that many parents do not follow best nutrition-related practices at home [3]. The majority of parents and ECE and care managers/teachers reported that their 3-4 year olds were sometimes rushed to finish eating in both at home and at the centre [3]. Parents and teachers may find it difficult to schedule seated, conversational and slow-paced meals and snack-times, but rushing a child when eating over-rides their internal satiety cues, which can lead to overeating or not eating enough quantity or variety of foods, exacerbating fussy eating. It is possible that ECE and care staff in New Zealand are not aware of healthy nutrition behaviours as there are no mandated standards in the sector, only recommendations promoted by the Heart Foundation (with only 20% of ECE and care services subscribing to their communications).

In 2016, the World Health Organization released the final report of its Commission on Ending Childhood Obesity (ECHO). The report urged governments to "take leadership" and for "all stakeholders to recognize their moral responsibility in acting on behalf of the child to reduce the risk of obesity" [13]. It contained four recommendations specifically related to ECE and care:

1. Require settings such as child-care settings… to create healthy food environments (1.8)

2. Ensure only healthy foods, beverages and snacks are served in formal child care settings or institutions (4.9)

3. Ensure food education and understanding are incorporated into the curriculum in formal child-care (4.10)

4. Ensure physical activity is incorporated into the daily routine and curriculum in formal child-care settings (4.11)

Active movement and teachers' perceptions

Two large reviews of physical activity among pre-schoolers have found low levels of objectively-measured physical activity among children while in ECE and care, consistent across several different countries, with no ECE environments providing 60 minutes of moderate to vigorous physical activity per day for 3 and 4 year old children [15, 16].

The large majority of ECE services in Auckland and Waikato, across all types of services, did not have a written physical activity policy in 2014, and many did not participate in a structured programme with a physical activity component [6]. This may have been because they did not perceive a need for the promotion of physical activity. Children were reported to spend nearly all of their time at ECE services in active play, in stark contrast to objective measurements of low levels of physical activity in NZ pre-schoolers in earlier NZ research [18].

There is a clear mismatch between the perception of ECE and care management and teachers, and the reality of sedentary behaviour of children in these environments [6].

A pilot intervention of a fundamental movement skills programme, Jumping Beans, in four ECE centres in low socioeconomic communities in Hamilton and South Auckland consisted of 10 weekly 45-minute exercise sessions and three teacher professional development sessions with a focus on "teaching staff how to use centre resources to give the children ample opportunities for physical activity". The pilot programme improved children's skills, but there was no effect on BMI at follow up, and the programme had difficulty improving teacher self-efficacy so that teachers felt confident to continue the programme without a 'coach' alongside. The researchers concluded: "teachers themselves were a key barrier to implementing physical activity… [as they] tended to externalise responsibility" and thus required substantially more professional development [18].

Although managers of ECE and care services in Auckland and Waikato reported that teachers led children in active play for some part of the day in most services [6], other NZ research has found examples where this is not always the case and can be limited by teacher beliefs and values regarding physical activity [19].

Teacher training

Intentional teaching of physical activity to children in NZ early education services appears low, and is the most effective way of increasing children's activity levels [20]. There is limited inclusion of nutrition in teacher training across the ECE sector in New Zealand and nutrition education opportunities for ECE staff are sparse. A possible way to achieve more professional development in nutrition for ECE staff would be to incorporate aspects of the Heart Foundation's Healthy Heart Award (HHA) into widespread teacher training and professional practice, and/or the expansion of health promotion programmes such as the HHA or Under 5 Energize, which promote knowledge transfer to staff. The HHA is currently voluntary and targeted to early education services in areas of high deprivation.

Helping ECE environments to promote physical activity

To improve child physical activity, ECE and care services should:

1 Reduce playground density – 5m^2 per child is simply not enough

2 Ensure that spaces are big enough to allow children to run

3 Provide child-portable play equipment

4 Incorporates outdoor areas suitable for movement and exploration by children at crawling and early walking stages of development

5 Incorporate climbing equipment suitably challenging for children aged 3-5 years of age that provides for upper body big-muscle use.

6 Increase opportunities for children to participate in structured physical activity and off-site active movement (e.g. weekly walks to open spaces, parks, local playgrounds)

7 Provide staff with training in physical activity.

The evidence presented in Detail Section Three of this report, shows that space in ECE and services in New Zealand is of pressing concern.

Recommendations (Goals 1.4 and 2.2)

1 Develop nutrition and active movement guidelines specifically for the ECE and care sector in New Zealand (preferably based on the World Health Organization's nutrition, physical activity, sedentary behaviour and sleep guidelines for early childhood education and care settings, which are currently under development).

2 Implement appropriate design training for teacher training for nutrition and food hygiene in ECE environments that will promote both nutrition and quality of life (incorporating aspects of the Heart Foundation's Healthy Heart Award (HHA) and/or Under 5 Energize into teacher training and professional practice).

3 Replace the commercial food service based MPI inspection programme for ECE centres with a food quality and hygiene assessment designed for ECE and care environments.

4 Environments that engage children with food, for example the kitchen being connected to the activity space, opportunities for children to help with food service, and on-site growing of vegetables and fruit, should be actively promoted by the Ministry of Education.

5 Outdoor environment should be large enough, with sufficient space per child, to allow children to be vigorously active, for example, to run.

6 ECE teachers should actively lead children in energetic play and structured games or activities that promote outdoor play and movement.

References

1. Birch LL, Anzman SL. (2010). *Learning to Eat in an Obesogenic Environment: A Developmental Systems Perspective on Childhood Obesity*. Child Development Perspectives 4(2).

2. Story M, Kaphingst KM, French S. (2006). *The Role of Child Care Settings in Obesity Prevention*. The Future of Children 16(1).

3. Gerritsen, S. (2018) *Realising the potential of early childhood education environments for obesity prevention.* PhD thesis, University of Auckland. Available from: https://researchspace.auckland.ac.nz/handle/2292/37026.

4. Gerritsen, S., Wall, C., & Morton, S. (2015). *Child-care nutrition environments: Results from a survey of policy and practice in New Zealand early childhood education services*. Public Health Nutrition, 19(9), 1531-1542. doi:10.1017/S1368980015002955.

5. Gerritsen, S., Dean, B., Morton, S. M. and Wall, C. R. (2017), *Do childcare menus meet nutrition guidelines? Quantity, variety and quality of food provided in New Zealand Early Childhood Education services.* Australian and New Zealand Journal of Public Health, 41: 345-351. doi:10.1111/1753-6405.12667.

6. Gerritsen S, Morton SMB, Wall CR. (2016). *Physical activity and screen use policy and practices in childcare: results from a survey of early childhood education services in New Zealand.* Australian and New Zealand Journal of Public Health, 40(4).

7. Childcare Research and Resource Unit, Childcare Canada (2017) Legislated Requirements: Table 1 Provincial/Territorial Food Policy Considerations.

8. L'Abbé M, Schermel A, Minaker L, et al. (2013). *Monitoring Foods and Beverages Provided and Sold in Public Sector Settings.* Obesity Reviews 14(S1).

9. Stacey, F.G., Finch, M., Wolfenden, L. et al. *Evidence of the Potential Effectiveness of Centre-Based Childcare Policies and Practices on Child Diet and Physical Activity: Consolidating Evidence from Systematic Reviews of Intervention Trials and Observational Studies.* Current Nutrition Reports (2017) 6: 228. https://doi-org.ezproxy.auckland.ac.nz/10.1007/s13668-017-0212-z.

10. Briley M, McAllaster M. (2011). *Nutrition and the Child-Care Setting*. Journal of the American Dietetic Association 111(9).

11. Gubbels J, Van Kann D, de Vries N, et al. (2014). *The Next Step in Health Behavior Research: The Need for Ecological Moderation Analyses - an Application to Diet and Physical Activity at Childcare.* International Journal of Behavioral Nutrition and Physical Activity 11(1).

12. Ward S, Bélanger M, Donovan D, et al. (2015). Systematic Review of the Relationship between Childcare Educators' Practices and Preschoolers' Physical Activity and Eating Behaviours. Obesity Reviews 16(12).

13. World Health Organization (2016). *Report of the Commission on Ending Childhood Obesity (ECHO)*. Geneva: World Health Organization

14. Yoong SL, Grady A, Wiggers J, et al. (2017). *A Randomised Controlled Trial of an Online Menu Planning Intervention to Improve Childcare Service Adherence to Dietary Guidelines: A Study Protocol.* BMJ Open 7(9).

15. Reilly JJ. (2010). *Low Levels of Objectively Measured Physical Activity in Preschoolers in Child are*. Medicine and Science in Sports and Exercise 42(3).

16. Hodges EA, Smith C, Tidwell S, et al. (2013*). Promoting Physical Activity in Preschoolers to Prevent Obesity: A Review of the Literature*. Journal of Pediatric Nursing 28(1).

17. Lucas P, Schofield G. (2010). *Physical Activity in the Early Childhood Education Centre Environment*. New Zealand Research in Early Childhood Education 13:125.

18. McLachlan C, Smith J, McLaughlin T, et al. (2017). *Development of Teachers' Knowledge and Skills in Implementing a Physical Education Curriculum: A New Zealand Early Childhood Intervention Study*. International Journal of Early Childhood 49(2).

19. Emberson H. (2016) An Exploration of the Nature of Physically Active Play in New Zealand Early Childhood Education (Thesis, Doctor of Education, University of Otago).

20. Bower JK, Hales DP, Tate DF, et al. 2008). *The Childcare Environment and Children's Physical Activity*. American Journal of Preventive Medicine 34(1).

Detail Section Seven

Infections and infection control

Mike Bedford

A blind spot in public health?

The importance of infections and infection control in ECE and care have seen remarkable little recognition as a public health concern in New Zealand, most particularly by the Ministry of Health.

The Ministry of Health document *An Integrated Approach to Infectious Disease: Priorities for Action 2002–2006* contained only three very minor references to early childhood centres. Early childhood centres were not mentioned at all in relation to respiratory infections, and not mentioned under 'the environment and infectious disease'. They were given a brief mention as (remarkably, referred to as 'crèches' in a table for 'Health and disability care institutions') in relation to handwashing [1]. More recently, the *New Zealand Health Strategy: Roadmap of Actions 2016* contained just one reference to ECE and care environments: "Enhance collaboration between early childhood services and health services for pre-schoolers, to improve early childhood education attendance and better address unmet health and development needs" [2]. This statement reflects a common false perception that attendance automatically provides a health advantage, without necessarily considering the quality of the environment, or any risk assessment.

The Health Resource *Nga Kupu Oranga*, published in 1998 was the only attempt at a comprehensive NZ health resource for ECE and care. it is has been unavailable in hard copy since 2001, and languished largely unrevised for over 20 years, (largely due to format changes before it was published that made updates difficult). It was also stripped of design information for hand washing and nappy change facilities before publishing, a change that will have helped perpetuate poor design for two decades.

Increased risk of infections in centre-based ECE and care

The relationship between childcare attendance and increased infection rates in children has been documented since the mid-1940s, if not earlier [3].

A systematic review without date or language limits, updated to June 17, 2006 included a meta-analysis of studies that included children exposed to childcare centres before three years of age, and with follow-up during the years of attendance or later [4].

For children attending childcare, compared with those cared for at home, risk increased as follows:

- Upper respiratory infections by 88%
- Otitis media by 58%
- Otitis media with effusion by 143%;
- Lower respiratory infections by 110% (pneumonia 70%, bronchiolitis 80%, bronchitis 110%);
- Diarrhoea / acute gastroenteritis by 40%.

By transforming the estimated risks into attributable proportions, they concluded that childcare attendance could be responsible for between 33% and 50% of the episodes of respiratory infections and gastroenteritis in the exposed population.

Another review around the same time [5] found that children cared for at childcare or in preschool education exhibit a two to three times greater risk of acquiring infections, which impacts both on individual health and on the dissemination of diseases through the community. In 2010–13 Dutch surveillance, children attending childcare consulted a medical doctor approximately twice as often for infections as non-attendees during the same period and for the same age group [6]

Giardia – water or children in ECE?

New Zealand and overseas research implicates ECE centres as likely reservoirs and transmission points for Giardia infections [7-11], yet this aspect of Giardia aetiology goes largely ignored in favour of attention on water. While NZ has giardia contaminated waters, the levels of contamination are in the order of ones or a few tens of cysts per 100 litres, or less. A bowel motion from an infected child can contain 100,000 Giardia cysts per gram. It was the third most common cause of gastroenteritis in the 2013-14 Dutch study, after norovirus and rotavirus.

Five surveys of 1,731 children for stool ova and parasites (1971 to 1981) in a South Carolina rural county resulted in the statement by the authors that:

> ...these results and other epidemiologic data indicate that as few as 100 children can maintain endemic levels of [Giardia] infection in a county of 18,000 residents. Person-to-person transmission in the childcare setting is sufficient to explain this country's rising rate of stool positivity of infection [7].

While it is impossible to prove causation, the increase in Giardia infection in New Zealand since the mid-1980s parallels the increase in child care.

Increased infection risk for infants and toddlers

The greatest risks of excess morbidity from childcare attendance-related infections occur in the first or second years of life. ECE and care attendance is associated with a considerable health burden to families from excess respiratory infections in children under two years of age. The differences between childcare centre and home-care groups are most marked in one-year-old children. [12].

Respiratory infections and ear infections

Centre-based ECE and care is particularly associated with increased levels of respiratory illnesses and ear infections [4, 13-17], and the effect of upper respiratory tract infections on the eustachian tube and the relationship to otitis media is well documented [18]. In a 1996 study three- to five-year old children in childcare experienced more upper respiratory symptoms and infections compared with children in home care. Approximately 14% of the common cold episodes and 26% of the acute otitis media episodes in this population were estimated to be attributable to childcare centre attendance. The occurrence of recurrent otitis media (13.5% vs 8.1%), recurrent croup (4.5% vs 2.8%), and doctor-diagnosed asthma (9.3% vs 8.6%) was higher in children who sometimes had attended a childcare centre compared with those who had never attended. Without considering the duration of the childcare centre attendance, the risk of recurrent otitis media was strongly related to the starting age, with a decreasing trend in the risk, the higher the age in attendance [15].

Conferred immunity balanced against severity, parental stress, and quality of life

There is evidence that early exposure to infections confers immunity [19-22], with fewer infections by school age, but this needs to be balanced against the risk of increased severity, complications, and sequelae. Araújo-Martins et al. [23] have suggested that when studying children's illnesses, it might also be important to consider the effect on parents, as diseases could enhance both child and parental stress. They cited evidence that stress induces cortisol release, and that cortisol exerts an inhibitory action over the immune system, while mothers of children with respiratory diseases, such as asthma, have higher levels of parenting stress.

Quality of life should also be an important consideration. While we may not remember being three months or three years old, quality of life matters as much then as at thirty. But there are two important differences. As a baby or toddler you lack the psychological defences of being able to 'just tough it out for a few days'. Not only this, but the days are much, much longer as a lived experience. The younger you are, the worse it is being sick, and the more dependent you are on a compassionate response from others.

New Zealand illness rates and sick leave

The winter-spring 2017 ECEE study recorded a total of 390 illness events, resulting in 1,715.5 sick days over 23 weeks, for 221 children. The proportions of illness were similar to those found in studies from other comparable countries.

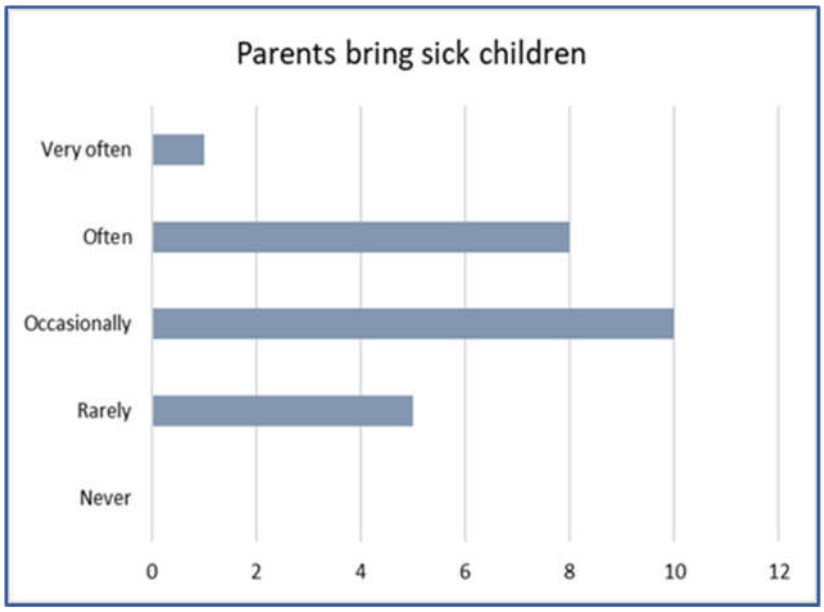
Apart from the unpleasantness and cost of an *average* one day sick per 2.7 weeks, the average and median rates of parental lost work days are important. The minimum sick leave allowance in New Zealand is five days per year. In this study, about half the parents needed more than that for half a year for just one child's illnesses. This does not take into account the child's siblings or the parents own (often consequent) illness, or injuries. It is completely inadequate given current rates of sickness in ECE and care.

Child sick days and parental lost work time

Child days sick	Average one day per 2.7 weeks	
Day care days off	Average one day per 5.0 weeks	Lost work per winter-spring half year
Parent lost work days (all parents)	Average one day per 7.3 weeks	
Parent lost work days if any time lost	Average one day per 4.8 weeks	5.4 days
Parent lost work days if any time lost	Median one day per 5.9 weeks	4.4 days

The illness rates and lack of sufficient sick leave places pressure on parents to bring children to their ECE centre when they are sick, putting pressure on teachers and managers to accept the sick children. Parents dosing children with Pamol before taking then the centre is widely recognised by teachers and managers, prompting the question (to the child) "did you have some pink liquid this morning?".

The ECEE study asked centre managers the question, "How often do parents bring sick children?", with the following result:



Five days is also the sick leave allowance for some ECE teachers, even though they are exposed to the same environment as the children, and may themselves have children. It is quite inadequate, resulting in teachers working while sick (see Detail Section Nine).

Hygiene practices in ECE - and gap in teacher training

The ECEE study revealed problems with hygiene practices and teacher understanding of infection control. The results were consistent with my own observations during over 100 in-service workshops for *qualified* teachers, in which a lack of understanding of effective hygiene procedure, lack of use of Te Whariki-based practice in children's self-care, and a lack of understanding of basic microbiology were evident. Feedback from one workshop was:

"Why are we not taught this? Everyone should get this training"

The ECEE study also asked about hygiene practices such as handwashing and nappy change. The scores in the table below were derived by assigning numerical values to the responses; 0 for 'rarely', 1 for 'sometimes', 2 for 'usually' 3 for 'nearly always', and 4 for 'always'. The total scores were the sum of responses from 21 early childhood centres.

Two measures were consistently good – child handwashing before eating, and teacher handwashing after changing nappies. Results for other practices showed considerable variation across environments.

The worst combined scores were for handwashing after nose-blowing at only 33%, with nine managers describing the frequency as 'rarely'. Child handwashing after toilet use was 74%, but the score for child handwashing after nappy change was only 57%, with eight managers describing the frequency as 'sometimes' or 'rarely'.

Total scores for hand hygiene practice across all centres in the ECEE study.

Action	Score	Percentage
Teacher handwashing after changing nappies	109/110	99%
Child handwashing before eating	117/120	98%
Child handwashing after toilet use	89/120	74%
Child thorough hand-drying after handwashing	79/120	66%
Child handwashing after nappy change	68/110	57%
Child handwashing after nose-blowing	40/110	33%

Cleaning practices varied considerably across the childcare centres, with combined cleaning scores for nappy-change area disinfection, table cleaning, toy washing and playdough use ranging from 20% to 100%. For example, disinfection of surfaces around the nappy change pad (as opposed to the pad itself) ranged from three to four times daily, to once in two or three weeks, while disinfection of objects around the pad ranged from 'twice daily' to 'not sure' or 'rarely'. Seven environments had shared soft toys ('comfort toys') and these were washed from 'once a week' to 'not often'. Fresh playdough was provided from once a day to once in two weeks.

Cost of infections

In 1999 the New Zealand cost of infections attributable to early childhood centre attendance was estimated at NZ$20–50 million per year, which for 143,540 enrolled children was approximately NZ$140 to NZ$350 per child **[24].**

The estimate indicated that ECE attributable infections in 2019 would (conservatively) be costing NZ$40 to 100 million per year in 2019 terms for current enrolment numbers, without taking into account an increased proportion of children under three years old.

The periods of illness number of days reported in the ECEE study were overall very similar to those found in a Helsinki study in 1985-86 [25], that estimated costs of illness due to illness in childcare. For the Helsinki study these figures were 4.9 illness episodes and 22.9 sick days per child per year, while the equivalent rates in the ECEE study were 5.1 illness episodes and 22.9 sick days. The Helsinki data was for children from birth to six years of age however, with data split at age three years. The days sick per child for children under three years was 39.3 days per year, and for children over three years it was 17.0 days sick per year. An expected New Zealand rate for a birth to six year age range would be higher than 22.9 days per year, as the ECEE study excluded children under two years old. The Helsinki study estimated illness related costs at US$3,525 for children under the age of three years and $1,012 for older children annually, for a total of US$22,485,000 in 1990 terms, for a population of 871,274. The estimate took into account childcare days lost (but paid for), medical costs, paid nursing costs and parental lost work time. In New Zealand it would be unusual to have paid nursing costs, so this aspect of the costing would need to be deducted by the allocated nursing cost proportion in the Helsinki estimate of 6%.

From this data an expected New Zealand equivalent cost would be in excess of NZ$300 million, but this is not the 'attributable' figure.

Recommendations

1. The Ministries of Health and Education, as well as Public Health Units, Medical Officers and Health Protection Officers need to take infections in ECE and care environments seriously, providing clear and appropriate advice on infection control. To this end, training is required for Public Health Unit staff engaging with ECE centres, including Medical Officers and other staff providing advice. Rather than leaving the development of resources to individual Public Health Units, there is a need for well researched, appropriately written national resources for ECE teachers and managers.
2. The Ministries of Health and Education need to develop a national programme, in cooperation with teacher training providers, for teacher pre-service and in-service health and wellbeing training (Goal 3.3).
3. The Ministry of Health, with the assistance of the Ministry of Education, needs to develop monitoring systems for the health of children in ECE and care including infection surveillance.

References

1. Ministry of Health, *An Integrated Approach to Infectious Disease - Priorities for Action 2002 -2006*. 2001.

2. Ministry of Health, *New Zealand Health Strategy - Roadmap of actions 2016*, M.o. Health, Editor. 2016: Wellington, New Zealand.

3. Allen-Williams, G.M., *Incidence of infections in war-time day nurseries - a preliminary study.* The Lancet, 1945. **246**(6382): p. 825-826. 10.1016/S0140-6736(45)91179-2 .

4. Sangrador, C.O.S., Ma V. B.; Martín, B. M., *Relationship between child day-care attendance and acute infectious disease. A systematic review.* Revista Espanola de Salud Publica, 2007. **81**(2): p. 113-129.

5. Nesti, M.M.M.G., M., *Infectious diseases and daycare and preschool education.* Jornal de Pediatria, 2007. **83**(4): p. 299-312. https://dx.doi.org/10.2223/JPED.1649

6. Enserink, R.Y., R.; Donker, G. A.; Smit, H. A.; Van Pelt, W., *Infectious disease burden related to child day care in the netherlands.* Pediatric Infectious Disease Journal, 2013. **32**(8): p. e334-e340. 10.1097/INF.0b013e318290601e.

7. Sealy, D.P. and S.H. Schuman, *Endemic giardiasis and day care.* Pediatrics, 1983. **72**(2): p. 154-158.

8. Enserink, R.L., A.; Suijkerbuijk, A.; Bruijning-Verhagen, P.; Smit, H. A.; Van Pelt, W., *Gastrointestinal and respiratory illness in children that do and do not attend child day care centers: A cost-of-illness study.* PLoS ONE, 2014. **9**(8). 10.1371/journal.pone.0104940

9. Pickering, L.K., et al., *Diarrhea caused by Shigella, rotavirus, and Giardia in day-care centers: Prospective study.* The Journal of Pediatrics, 1981. **99**(1): p. 51-56. 10.1016/S0022-3476(81)80956-0

10. Hoque, M.E., et al., *Children at risk of giardiasis in Auckland: A case-control analysis.* Epidemiology and Infection, 2003. **131**(1): p. 655-662. 10.1017/S0950268803008598

11. Lal, A., et al., *Seasonality in human zoonotic enteric diseases: A systematic review.* PLoS ONE, 2012. **7**(4). 10.1371/journal.pone.0031883

12. Louhiala, P.J.J., N.; Ruotsalainen, R.; Jaakkola, J. J. K., *Form of day care and respiratory infections among Finnish children.* American Journal of Public Health, 1995. **85**(8): p. 1109-1112.

13. Haerskjold, A.K., K.; Kamper-Jørgensen, M.; Nybo Andersen, A. M.; Ravn, H.; Graff Stensballe, L., *Risk factors for hospitalization for respiratory syncytial virus infection.* Pediatric Infectious Disease Journal, 2016. **35**(1): p. 61-65. 10.1097/INF.0000000000000924

14. Marx, J.O., D. J.; Parsons, G., *Day Care and the Incidence of Otitis Media in Young Children.* Otolaryngology- Head and Neck Surgery, 1995. **112**(6): p. 695-699. 10.1016/S0194-59989570178-8

15. Nafstad, P.H., J. A.; Oie, L.; Magnus, P.; Jaakkola, J. J. K., *Day care centers and respiratory health.* Pediatrics, 1999. **103**(4 I): p. 753-758. https://dx.doi.org/10.1542/peds.103.4.753

16. Heinrich, J.K., B., *Child health and child care in under 3-year-olds.* Monatsschrift fur Kinderheilkunde, 2008. **156**(6): p. 562-568. 10.1007/s00112-007-1607-5

17. Mack, I.K., E.; Cangiano, G.; Tapparel, C.; Kuehni, C.; Spycher, B.; Kaiser, L.; Frey, U.; Regamey, N.; Latzin, P., *Rhinovirus infections and associated respiratory morbidity in infants: A prospective cohort study.* Pediatric Infectious Disease Journal, 2016. **35**(10): p. 1069-1074. 10.1097/INF.0000000000001240

18. Zielhuis, G.A.H.-H., Els W.; Rach, Gerold H.; Van Den Broek, Paul, *Environmental Risk Factors for Otitis Media with Effusion in Preschool Children.* Scandinavian Journal of Primary Health Care, 1989. **7**(1): p. 33-38. 10.3109/02813438909103668

19. Hurwitz, E.S., et al., *Risk of respiratory illness associated with day-care attendance: A nationwide study.* Pediatrics, 1991. **87**(1): p. 62-69.

20. Schuez-Havupalo, L.T., L.; Karppinen, S.; Kaljonen, A.; Peltola, V., *Daycare attendance and respiratory tract infections: A prospective birth cohort study.* BMJ Open, 2017. **7**(9). 10.1136/bmjopen-2016-014635

21. Haby, M.M.M., G. B.; Peat, J. K.; Leeder, S. R., *Daycare attendance before the age of two protects against atopy in preschool age children.* Pediatric Pulmonology, 2000. **30**(5): p. 377-384. 10.1002/1099-0496(200011)30:5<377::AID-PPUL3>3.0.CO;2-3

22. Shope, T.R., *Infectious diseases in early education and child care programs.* Pediatrics in Review, 2014. **35**(5): p. 182-193. 10.1542/pir.35-5-182

23. Araújo-Martins, J.C.M., P.; Viegas, J.; Aelenei, D.; Cano, M. M.; Teixeira, J. P.; Paixão, P.; Papoila, A. L.; Leiria-Pinto, P.; Pedro, C.; Rosado-Pinto, J.; Annesi-Maesano, I.; Neuparth, N., *Environment and Health in Children Day Care Centres (ENVIRH) - Study rationale and protocol.* Revista Portuguesa de Pneumologia, 2014. **20**(6): p. 311-323. 10.1016/j.rppneu.2014.02.006

24. Bedford, M.J., *A Needs Assessment of Early Childhood Centres with respect to Non Vaccine-preventable Communicable Diseases*. 1999, University of Otago: Master of Public Health thesis.

25. Nurmi, T.S., E.; Pönkä, A., *Infections and other illnesses of children in day-care centers in Helsinki II: The economic losses.* Infection, 1991. **19**(5): p. 331-335. 10.1007/BF01645358

Detail Section Eight

Ergonomics and injury prevention

Susan Bates and Mike Bedford

Two very different populations

ECE environments need to cater for two very different populations, the children and the teachers. This requires special consideration of ergonomics to meet the needs of both groups. Ergonomics is not only concerned with physical strain, but also with the facilitation of good practice. Most of the effort on ergonomics in ECE environments has gone to the design of play equipment related to child anthropometrics and injury risk, but not to children's general life activities, or to ergonomics for teachers.

For children, ergonomics may include the design of tap handles that work with a child's arm strength rather than wrist strength, such as horizontal lever taps (automatic taps do not teach responsibility). It will include design of handwashing and drying facilities that encourage good practice in both, such as the placement pf paper towels, or the use of a mirror behind the wash trough. It will also include the design of storage facilities that enable children to get out and put away equipment themselves, and the height of windows for views outdoors or between rooms. Spatial ergonomics will see the use of mezzanine structures or furniture, built to child scale, that provide 'under' and 'over' spaces, both of which can be aids to emotional wellbeing.

Poor ergonomics for teachers

The work of the Wellington Regional Public Health Unit ECE centre programme in the 1990s and 2000s revealed widespread problems with ergonomics for teachers. Nappy change areas caused teachers to bend from waist, twist, and engage in avoidable lifting of children. Teachers were assigned to nappy change for excessive periods of time. Hand washing and bathing facilities were poorly designed, and not conducive to good hygiene practice, for example a hand basin that required a teacher to turn way from, and let go of, a child on a change table, preventing safe hand washing during nappy change.

The Public Health Unit staff observed very poor outdoor area design, especially in relation to sandpit covers, with low level heavy lifting and bending. Storage facilities were badly designed, requiring teachers to get out and put away equipment the children could have obtained for themselves.

Cot design was also poor, forcing teachers to bend from the waist to lift children. Perhaps the most pervasive and remarkable aspect of poor ECE environment ergonomics is the lack or absence of adult-sized furniture in activity areas or for use when settling children to sleep. Teachers are often required to sit on the floor in a sleep room, using a wall for back support. There have even been reports of a refusal by ECE centre management to provide adult furniture, on the premise that teachers wouldn't be working if they sat down. Aside from an abusive attitude towards an occupational group, this reflects a serious lack of understanding of children's needs for seated-adult

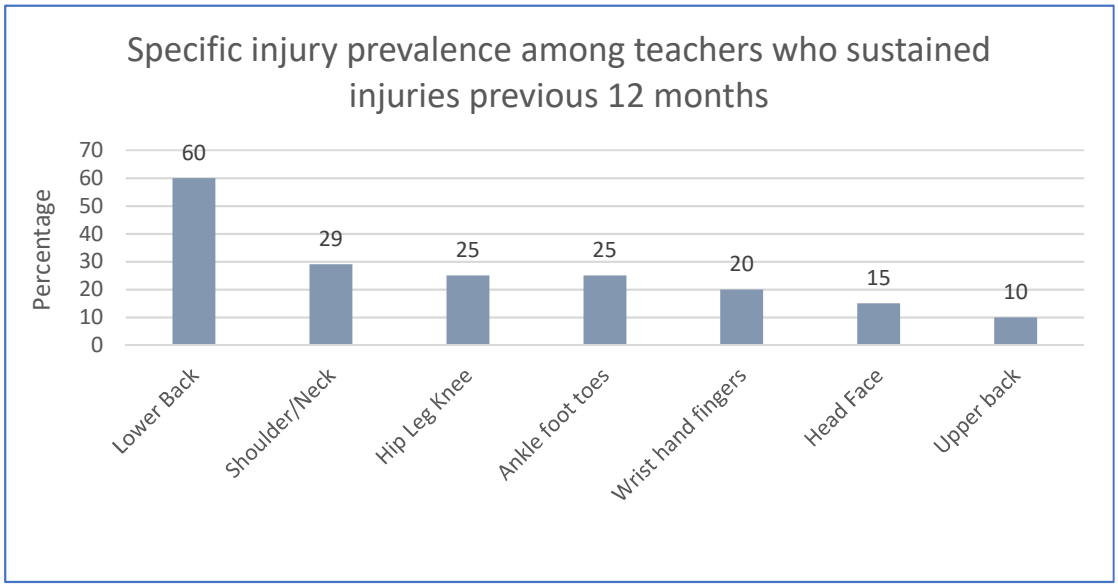
attention and adult:child interaction. Teachers need movable furniture that can be strategically placed for conversations and supervision, and comfortable floor or ground spaces for infant and toddler interaction with their carers (attachment figures). Interactions are the basis of learning in ECE and care – child-child, child-environment, child-adult.

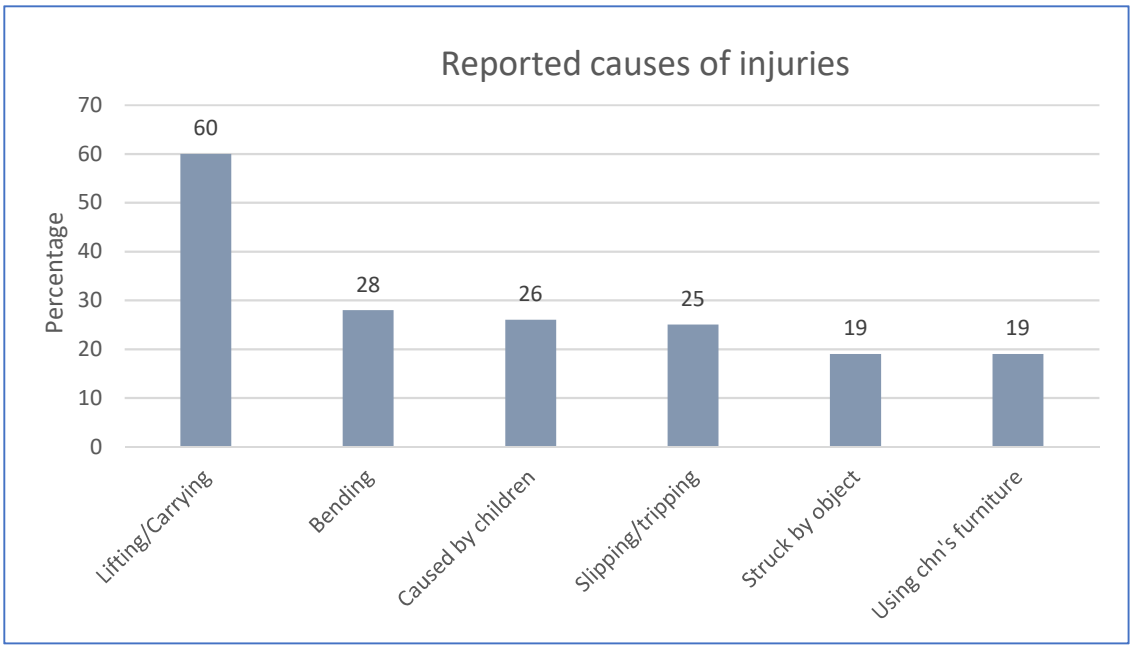
For these reasons, the following section is focussed mainly on ergonomics for teachers. Much of the information is drawn from a 2017-18 Ethics New Zealand approved, 72 question survey of teacher health and wellbeing, conducted through social media. There were 706 respondents.

Injuries

The job of early childhood teachers is multi-faceted and demands investment emotionally, spiritually, mentally and physically. The physical demands are creating injuries which are then contributing to and aggravating other conditions, resulting in a wearing down of the body, but also causing mental fatigue. Chaos, poor working conditions, lack of space, numbers of children, and noise are all contributing factors. Injuries increase stress, which increase injury.

Of the respondents in the 2017-18 survey, for the previous 12 months, 44% of teachers had sustained an injury. A quarter of teachers had experienced injury to the lower back in that one year, while of those who experienced any injuries in the previous twelve months 60% had lower back injury.





Many of these teachers are of child-bearing age and are sustaining injury while pregnant. 34% of all respondents reported during their time as ECE teachers. 31% reported difficulties with their pregnancies including back strain, miscarriages and high blood pressure.

A further injury to teachers that has been noted in this survey is voice injury. 33% of teachers have experienced voice injury due to overcrowded rooms, large group sizes, illness and chaos.

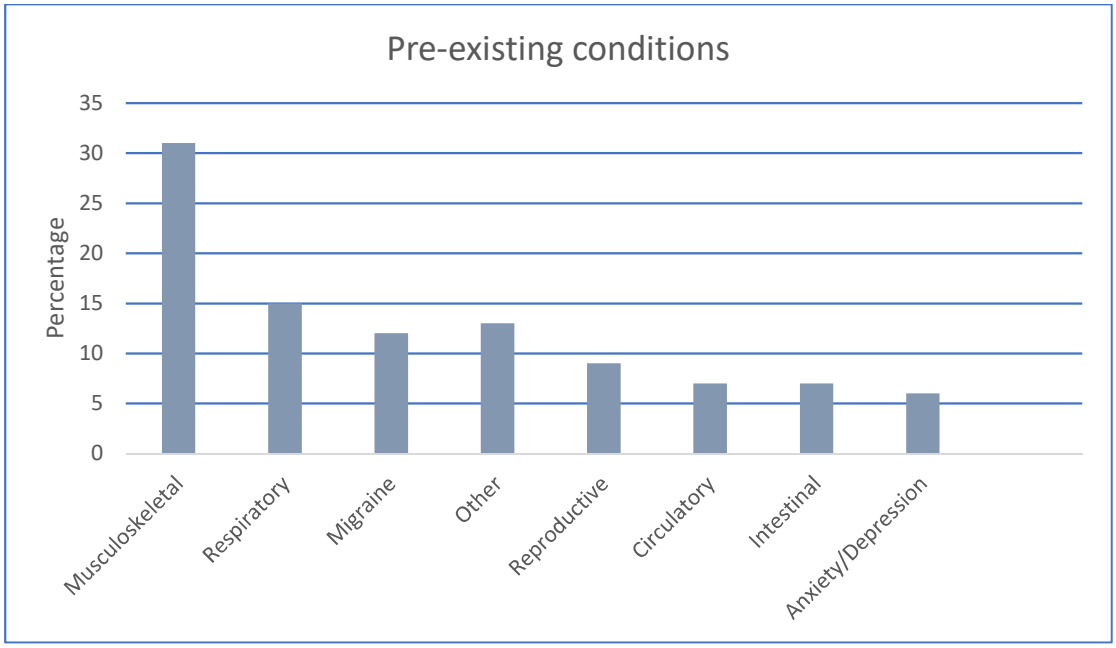
Stress is a clear contributor to injury. 31% of respondents described their jobs as stressful and very stressful (see Detail Section Nine), all had sustained an injury in the previous 12 months.

Pre-existing conditions (prior to one year before the survey)

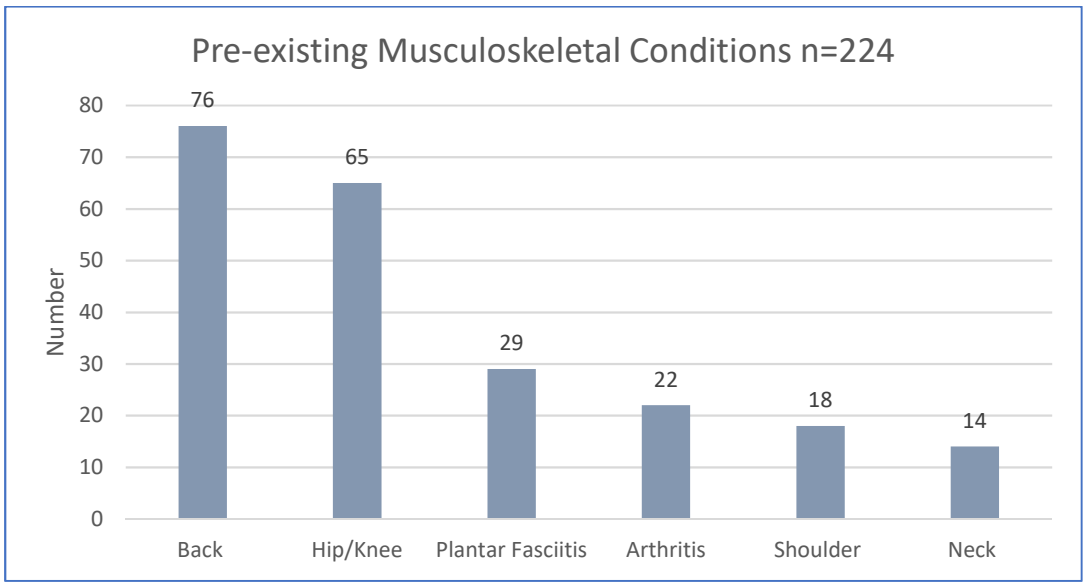
Along with injuries incurred in the last year, 57% of the teachers were already carrying various medical conditions. Most of these are musculoskeletal and occur in every age group, although some of the older teachers will have been carrying older injuries. Most were suffering from more than one condition, while some were dealing with several issues. Those suffering from migraines for example are also managing a wide range of illnesses. The total number of health issues reported was 633.

Reproductive issues include a range of conditions, e.g. polycystic ovarian syndrome (PCOS), various menstrual problems, pregnancy and menopause. The 'other' category includes a wide range of complaints including diabetes, neural complaints, thyroid, liver, post-operative complications, immune breakdowns, skin conditions, stroke and hearing loss.

Respiratory conditions include asthma and allergies, which the younger teachers suffer from more than the older ones. The working environment is critical to managing these conditions.



The most common health problems (31%) are musculoskeletal.



Whether or not these conditions originate with working in the ECE environment, they must all be managed in the workplace, during every work day. Potentially damaging physical workloads such as all-day nappy change duties or moving poorly designed/stored equipment can exacerbating injuries and are part of a wider picture of fatigue and stress.

Teacher comments

A post from a teacher on the Teachers Advocacy Group Facebook page in February 2019 made this statement:

> "Our job is dangerous, and I would like to shed some light on it. My latest and most serious injury I got was from saving an autistic toddler from a head injury when she unexpectedly threw herself at me from a box as I was in the middle of climbing the treehouse to join her. As I awkwardly twisted and caught her in my forearm. I tore my rib muscles and ruptured a disc in my back. Had I not had been strong enough to stop myself falling back, it would have been worse. A long and painful 6 months off work.
>
> What's your story?"

The following are from the responses the above post (FB) and from the 2017-18 Teacher Health Survey (THS), describing the nature and causes of injuries. Some relate to design while others reflect the challenges inherent in working which very young children. Although some of the individual comments can't be assigned to specific conditions in the space, they are characteristic of accidental impact and trip hazards in crowed spaces, strain from poor ergonomics, or simply the hard physical work inherent in lifting and carrying children, or working a child height.

- 'Walking into children's furniture' (THS)
- 'Tripped on a toy and fell hard onto my knee as I was carrying a three month old baby – protected the baby.' (THS)
- 'Slipped on a toy and damaged my rotator cuff'. (FB)
- 'Falling over equipment left on the floor.' (THS)
- 'Not enough space between the cots to be able to put children in or lift them out of before after sleep'. (THS)
- 'Moving fast to stop children from hurting themselves or others and banging into walls, doors etc'. (THS)

- 'Overuse from years of nappy changing'. (THS)
- I'm in the same boat – a back and neck pain continuously causes me upset especially when I'm changing nappies. (FB)
- 'Bad back from years of working with younger children'. (THS)
- 'Lifting children'. (THS)
- 'Lifting heavy equipment'. (THS)

- ‘Standing for a long time in order to supervise children’. (THS)
- ‘Kneeling, crawling’. (THS)
- ‘Having to sit on children’s chairs when supervising lunch as you are not allowed to stand over them’. (THS)
- Tendons in back and front of knees means my knees just collapse at any time… plantar fasciitis from being feet all day every day…’ (FB)

The children themselves can be a source of injury. To some extent this is a risk inherent in working with very young children, but it is exacerbated by crowded and stressed conditions that make it more difficult maintain a calm environment. Seven out of nineteen injuries described on the Facebook page were caused by children, and of these, three involved children with autism. Autistic behaviours can be especially hazardous for ECE teachers in a group environment, especially if conditions exacerbate those behaviours.

- ‘Previously I've had another child with additional needs throw themselves into a tantrum when being held and have put my back out. Also another autistic boy "flop" while assisting him... Pulled my back several times with that child and got to the point where I just would not lift him ever... Just too heavy. It's hard as due to developmental delays they need assistance the same as a much younger child but just can't physically provide it.’ (FB)
- ‘One back injury for lifting and separating 2 fighting boys. 1 wrist injury from the same child hitting me on another occasion’. (THS)
- 5 months off work and shoulder surgery after a heavy non-verbal autistic boy dropped to the ground suddenly whilst holding my hand. Tore my rotator cuff-still not right a year after surgery. Now have inflamed elbow from the 60 odd nappy changes I do every week on 3 year olds who should really be toilet trained! (FB)
- ‘I am caused harm predominantly by excited children wanting attention and attempting to hang off me.’ (THS)
- ‘Hit on the back by child with a heavy spade’. (THS)
- Sprained my ankle, shoulder and side after a child jumped on my back as I was crouched down picking up toys. My ankle is now permanently weak and painful at the end of each day. A week later, a child bite into my finger on the joint and hitting a nerve, drawing blood so I needed to go and get a tetanus shot. (FB)

In addition to the physical work inherent in ECE and care, in many ECE centres teachers are expected to do tasks that would not normally be assigned to employees, as these example show:

- ‘Cleaning out the gutters’. (THS)
- ‘Moving a fridge’. (THS)
- ‘Poor maintenance upkeep of grounds by management. Doing management/owner maintenance tasks while working/supervising with children.’ (THS)

Comments on the Facebook page also indicated a poor response from ACC:

- 'Very bad lower back pain of lifting children for years to change their nappies and ACC doesn't accept because it isn't accident… Have been in to physio, chiropractic, osteopath, Alexander technique, and all kinds of massage therapy paying with my own money'. (FB)
- I couldn't get ACC – had years off work coz of it – they said gradual process injury cannot be pinned to work'. (FB)
- 'Yeah ACC have been pretty hard for me to. They spent the majority of my time trying to kick me off it'.

Any work force with an indication of a 26% back injury rate in one year should receive the serious attention of Worksafe NZ and ACC.

While these injuries cannot all be attributed to the ECE working environment, the observations and descriptions of serious ergonomic and practice issues suggest that the ECE environment will be substantially to blame.

Recommendations

1 Workplace New Zealand and ACC need to undertake an investigation of injuries to early childhood teachers. The ACC category of 'Early childhood worker' needs to be split in to teachers and non-teaching staff, as the non-teaching staff statistics, which will include administrative staff and food handlers, will dilute the teacher statistics.

2 Workplace New Zealand needs to enforce the health and Safety at Work Act 2015 in ECE environments, with prosecution for unsafe facilities and practices as necessary.

3 Early childhood centre management and teachers need to be provided with training in ergonomics, hazard reduction for adults and design and practice to avoid injury. This should be an essential element in pre-service and in-service teacher training.

4 Adequate adult furniture in activity areas and associated with settling children to sleep must be mandatory. Toddler rooms need adult chairs to hold and comfort distressed children, and to change children's clothes, socks and shoes.

5 Space needs to be improved to avoid congested areas with trip and legs injury hazards. This is of utmost importance in infant and toddler areas, where a teacher is more likely to be carrying a child.

6 We strongly support the Strategic Plan goals to improve ratios and to limit group size. These two factors are related to the difference between calm, busy environments and noisy chaotic ones in which injuries are more likely.

7 A standard is need for nappy change and bathing area design to avoid poorly designed facilities. The use of 'shubs' for bathing is particularly inappropriate given the risk of back injury. The need to be replaced with wet area showers with detachable shower heads, and in-bench infant bathing tubs if that age group is present.

8 Children with special needs require higher standards for spaces, ratios, and group size limits, as well as specific training for ECE teachers. To achieve this there is a need for targeted funding.

Detail Section Nine

Teacher stress mental / emotional health

Susan Bates

There have been indications from the news media and social media that stress is an issue for ECE teachers, along with workplace bullying and poor working conditions such as those described in the previous Detail Sections. In 2017-18 there were at least three instances of teachers using disguised voice in the news media and disguised face for TV) when describing very bad working conditions and employer bullying.

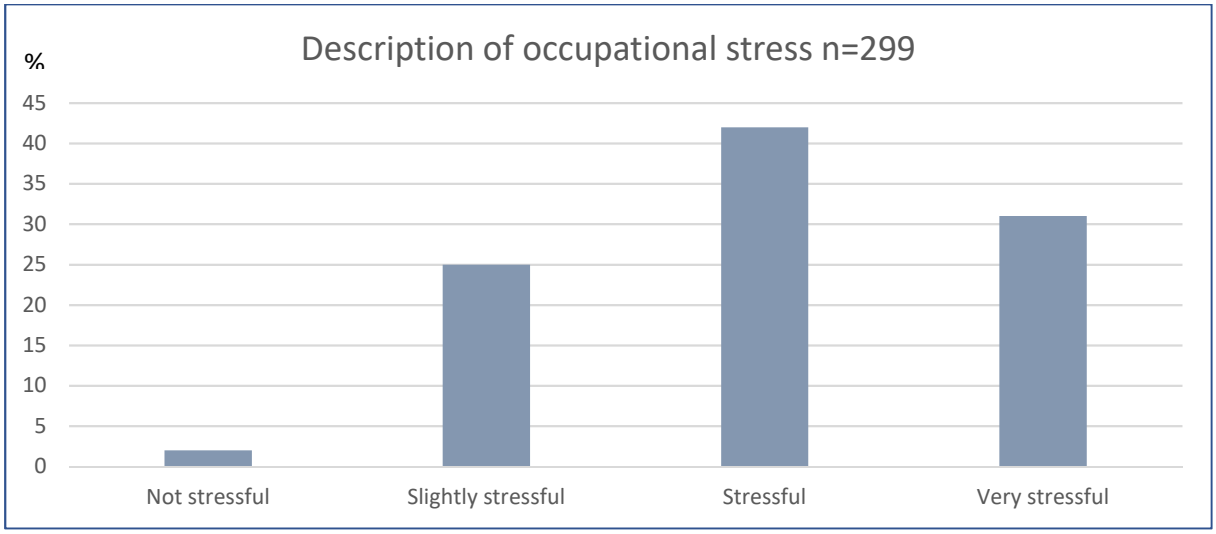
ECE teaching carries a strong emotional load, as teachers need to relate to children at a personal level, and manage a wide range of challenging socio-emotional conditions in the children they care for. These conditions can be disturbing, even without the added burden of long hours, documentation (e.g. 'learning stories'), and relationships with sometimes dysfunctional parents and families.

The 2017-18 Teacher Health Survey contained questions directly about stress, but also contained questions about conditions such as disturbed sleep that are stress related. The survey had approval from Ethics New Zealand, and was conducted through social media. There were 706 respondents.

Stress and mental health

There were four questions in the survey which specifically asked about stress. Only 42% of teachers (299) answered these questions. Of these 299 respondents 43% (127) described their jobs as 'stressful' and 31% (93) as 'very stressful' have in common, a total of 74% (220).

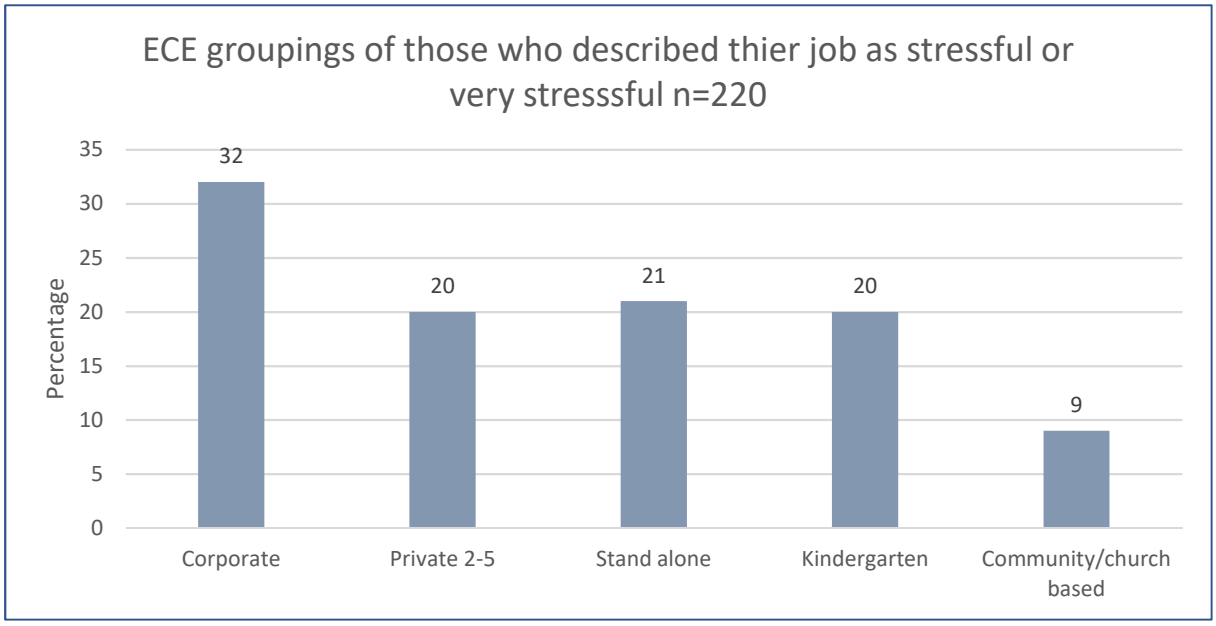
When asked to rate symptoms that can be stress related all teachers responded, and a significant proportion (up to 25%) showed they were likely to be suffering from stress in their workplaces, even though they declined to answer the direct stress questions. The reasons are probably complicated, but some may be that they don't recognise stress, will not acknowledge their stress for reasons that may impact on their view of their professionalism and competence in the job.



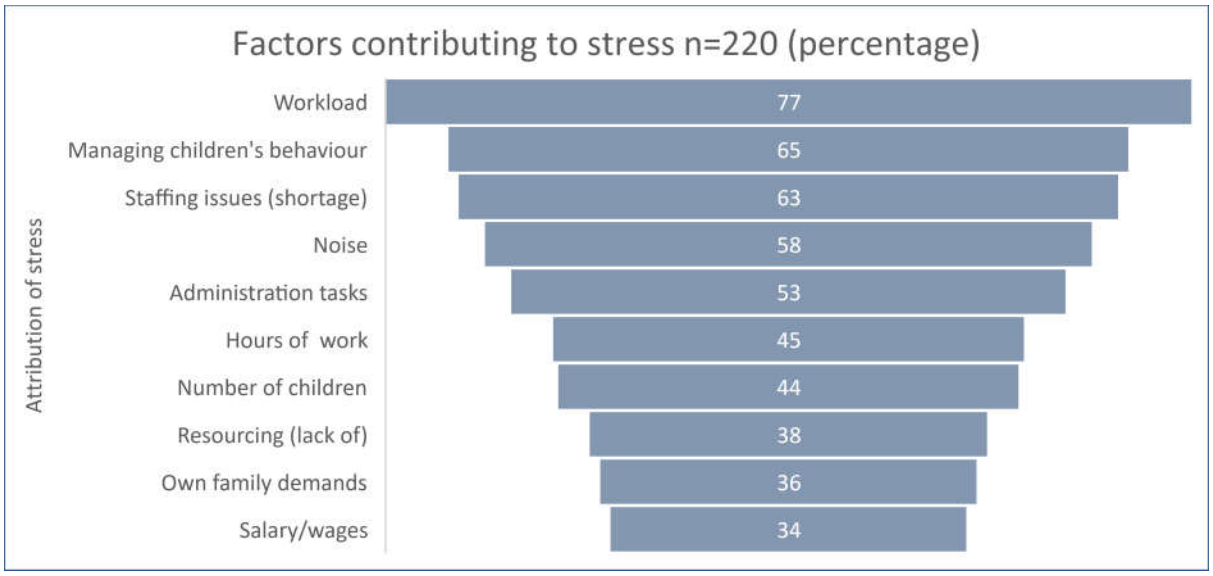
63% of respondents stated that the job interferes unduly with their private lives. This is a recognised indicative factor in workplace stress.

55% stated that they had thoughts of leaving their jobs often or very often in the previous 12 months. Only 31% saw themselves in the sector in five years. This is not a good projection of teacher retention.

From the respondents who answered the questions about stress, respondents describing their conditions as 'stressful' or 'very stressful' are shown below. Over 50% more respondents from the 'corporate' grouping (more than 5 centres under the same ownership), indicated 'stressful' or 'very stressful' than for the next highest groups, which were in turn over twice as likely to make this report than the lowest rating group, 'community or church based'.



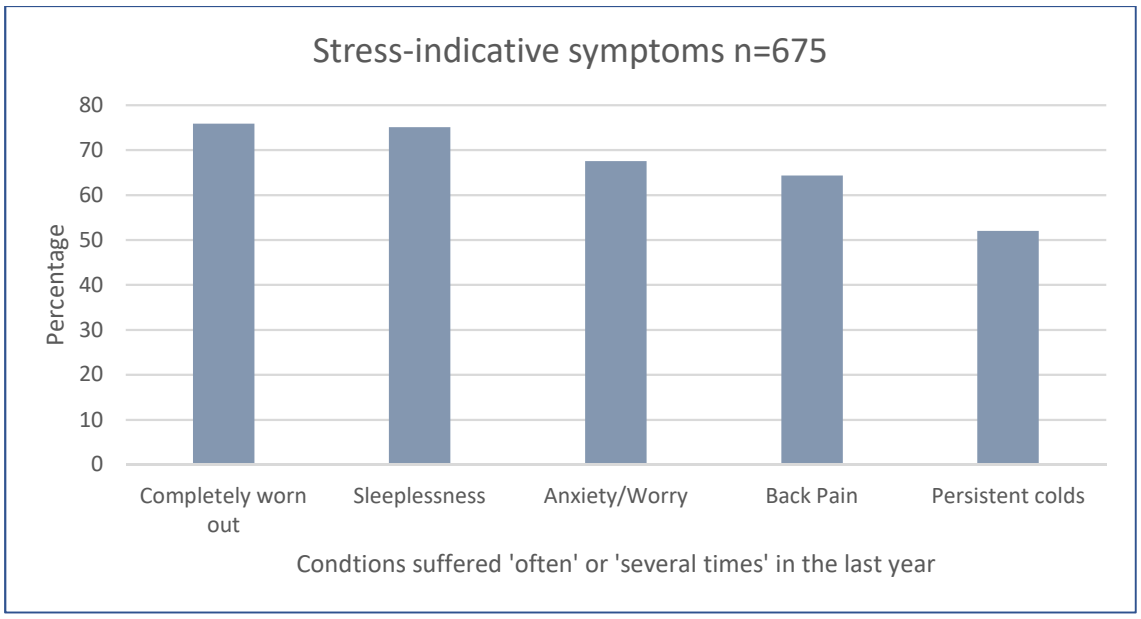
Some of the reasons given by these 220 teachers (job rated 'stressful' or 'very stressful') are shown below.



Every teacher in this group had sustained an injury in the previous 12 months, and 91% had incurred infections. They described rooms which are too noisy often or very often (72%), only one third describe their staffroom as adequate or good.

Indicators of stress

There are a number of physical symptoms that indicate the presence of stress. While only 43% of respondents answered questions directly about stress, 96% (675) answered the questions about symptoms related to stress. The graph shows the percentages of those experiencing these conditions 'often' or 'several times' in 12 months.



When asked about the least satisfying or most difficult aspects of their role, 29% named paperwork, some of which they were not trained in, such as evaluation and planning. There was a sense of scrutiny and need a to defend their roles, and stress from inadequate time to form essential relationships with children.

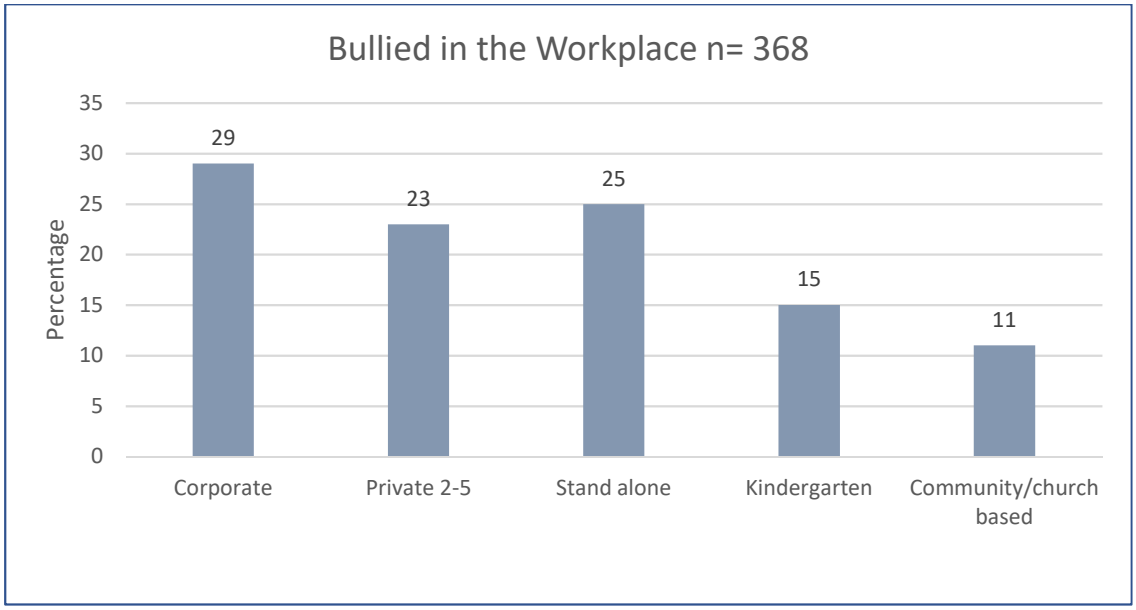
The following comments were given as causes of stress.

- ‘Documentation to prove what I’m doing’.
- ‘The overwhelming amount of paperwork’.
- ‘Not being supported by management’.
- ‘When the group size is too big, and the day feels like crowd control. Children are in constant conflict with one another - it feels like putting out fires all day. Also, when we have children with particularly challenging behaviour and no support - getting punched, kicked and having things thrown at you - and also feeling worried other children are at risk of being harmed and you might not see it or get there in time to intervene’.
- ‘When management start too many new children at once. Not allowing the teachers adequate time to build relationships with each new child’.
- ‘The cleaning, not enough staff, having too big of a work load’.
- ‘Not giving children what they deserve’.
- ‘The high number of children. I find it too busy and actually quite detrimental to children's health. Even with supposed ratios being kept (mostly) it's still too much for quality care. New children or (those with) learning needs can't cope.’
- ‘Everything. Low staff ratio on the floor yet on the paper it is perfectly well organized for the ministry Unable to take breaks on time Missing out on non-contact due to lots of children and less staff Too much staff problems that go unsolved Too much pressure and no help or support from the management or ministry’.
- ‘It's often noisy, too busy, you feel stretched & stressed. Can't give individual kids the attention they need & deserve. Some days it just feels unsafe- too many kids & adults all busy doing other things. Some days you are just dealing with literal shit and think I didn't get a degree to deal with this.’

Bullying

When bullying becomes part of a culture, it can become the ‘norm’ and is less likely to be recognised for what it is. The fallout can be devastating.

53% (368) of all respondents have experienced bullying in their workplace in some form. These respondents describe feeling emotional, stressed, suffering anxiety and depression, sometimes for years after the event. A few have been diagnosed with PTSD. Loss of confidence, self- esteem and not wanting to go to work were common responses.



The following are comments given in relation to bullying in the workplace.

- ‘Felt broken, stressed and had an emotional breakdown’.
- ‘I wanted to give up teaching and I questioned my whole being as an individual.’
- ‘Mental stress, anxiety, avoiding work where possible, led to increase in sick days due to stress related illness’.
- ‘I have been put on anti-depressants and attended counselling. Can’t eat, sleep and crying all the time’.
- ‘Not in my current environment however I left my previous work place due to this’.
- ‘Started to become unmotivated and checked out. Crying at home and fighting with husband. Withdrawn and not as positive’.

Te incidence of stress and mental health issues may be greater than the numbers who have described their circumstances in this survey. Not acknowledging the existence of what might be perceived as ‘mental health’ problems is still common. The stigma attached to mental health remains real.

A few respondents described their feeling of powerlessness when witnessing bullying of others in their workplaces. This is the topic of an increasing amount of research into workplace culture, bullying and stress. Even fewer described having enough self-confidence to face the bullying head on and become proactive in removing it.

The solutions to bullying and mental health may not be as clear as preventing some injuries, but dealing with workload, noise, getting decent breaks, compulsory non-contact time, dealing with bullying, and other improvements in environment and working conditions, will go a long way to relieving much of the stress in the sector.

Adding 'mental health' days to an increased quota of sick days and annual leave, will allow respite, recovery and seeking appropriate help when it is needed.

There is little awareness or acknowledgement of 'stress' or mental health among teachers themselves. There is certainly little if any training included in the Initial Teacher Education, although there are now increasing opportunities to attend Professional Development in some areas of stress management.

Recommendations

1. The Ministry of Education needs to work with Worksafe NZ to encourage a culture of respect for the teaching workforce.
2. Workplace bullying in ECE environments needs to be regarded as a critical quality issue in relation to the care of children, and a concern for workforce retention. It must not be treated as only an issue between employers and employees.
3. There must be adequate staffrooms included in every ECE and care centre providing restful, comfortable space for recuperation and time to use them. It is essential that teachers are provided with the breaks they are entitled to. This is a teaching and quality of care issue as well as an employment issue. It must be addressed by the Ministry of Education.
4. Teachers and other ECE and care staff are exposed to infections via the children, and need sick leave to cover this. It is neither reasonable nor good practice to require teachers to work while sick. Minimum sick leave needs to be increased to at least 10 days per year.
5. Support for special needs children is also a teacher health issue. Children with special needs require extra attention and may present safety issues for other children and teachers. Not providing for this in teacher:child ratios endangers the child with special needs, other children and the teachers.
6. There is a need for compassionate recognition of and support for teachers who have specific health problems or disabilities. Pre-diabetic and diabetic teachers for example, must be given decent regular breaks to manage their insulin levels. Those who are sensitive to noise must be given respite during the day.

Detail Section Ten

Teacher and ECE Manager training

Mike Bedford and Susan Bates

Observations from Mike Bedford

Over the past 25 years I have presented in the order of 150 interactive workshops, lectures and other presentations to ECE teachers. I have investigated and advised on about 50 ECE infectious disease outbreaks, and provided design consultancy for over 30 ECE centres. Through the Wellington Regional Public Health Programme I have made about 1500 advisory visits to about 700 centres across the ECE and care spectrum.

I have a great respect for the passion and dedication of the ECE teaching workforce, but through this work I can make a number of observations about teacher knowledge and training.

1. There is a lack of understanding of the integrated and holistic nature of Te Whāriki. Wellbeing in particular and to some extent belonging, are frequently neglected, and are separated from the whāriki of child learning, living and development (see Te Whāriki deconstructed in Detail Section One).
2. Teachers show only a normal NZ adult level of understanding of disease prevention, which is woefully inadequate for infection control in the ECE and care setting. This lack of knowledge leaves teachers vulnerable to poor advice, poor practice, and commercial sales tactics, and indicates a systemic failure in teacher training.
3. Teachers and managers showed little understanding of practical aspects of building design and fit-out, and healthy building conditions, which will have contributed to the heating and ventilation issues described in Detail Section Four.
4. Teachers and centre managers frequently showed little understanding of interior and exterior design, or the perceptual, sensory, spacial and social aspects that should be inherent in good design for children and adults.
5. Centre managers and developers who did not have ECE training demonstrated a serious lack of understanding of both children's and teachers' needs.

From my own involvement I see improvement to teacher education in health and environment design as essential, along with a requirement for a minimum level of training for ECE and care centre managers.

From Susan Bates

My observations are derived both from my own experience during a B.Ed (ECE) and my experience as a teacher in about 60 ECE centres. I have also been actively engaged in research in ECE and care for seven years.

My experience leads me to conclude that the following areas of teacher education are need considerable improvement.

Infant mental health.

- The importance of attachment, the effect on the structure of the brain, recognising possible rupture in the attachment relationships, how ECE can mitigate and avoid these problems.
- Strategies for cases of disorganised, ambivalent and fearful attachment, and knowledge of ways to access professional help.
- Infants should NOT be allowed to 'cry it out' in ECE. They are NOT self-soothing. (I have come across this in many centres, usually where the head teacher is unqualified, but not always).

Paediatric health and infection prevention

Recognising childhood diseases, understanding how infections are passed on, isolation requirements. This includes the difference between viral and bacterial environmental survival and transmission, infections, the role of antibiotics, and clearance periods.

Understanding of physical development

Teachers need to be better training in the incredible importance of nutritional understanding for growing children, the need for access to drinking water, as well as daily vigorous exercise. Monkey bars, sandpits and water play are necessary, but they are not the only outdoor activities required. Children need to be able to run, and to climb something more than a 1.2 m box.

Neurodiversity

Although many children in ECE are not neurotypical, many teachers receive no training in neurological development, nor do they have access to the necessary expertise in a timely manner.

Speech/language

My own estimate is that one quarter or more of children in a typical ECE room in NZ may have a speech/language difficulty, a hearing problem, be learning English (the mode of instruction in most centres) as a second or third language. Most teachers receive no training in any of these areas, yet many strategies to assist these children are fairly simple.

Noise management

To assist with noise reduction, teachers need training in noise management – use of quiet voices, and other techniques to reduce noise.

Teacher self-care

Teacher training does not normally cover self-care and risks to mental health, or the ways in which stress affects physical wellness. The pressures and emotional load of working with children, sometime in situation with dysfunctional; family situations, health or developmental problems, or in poorly managed centres can be overwhelming. These include stress, bullying, grief, and overwork. Over/under eating, sleeplessness, anxiety and so on. These then contribute to the level of stress.

Teacher training does not normally covers risks to teacher health, (or their own family), risk during pregnancy or ways in which older teachers need to protect their bodies from injury.

Management knowledge

There is a clear need for training for ECE and care service management. This is perhaps the serious gap in ECE centre qualification and training. Poor management can do tremendous damage directly to children and staff, and indirectly by way of damage to staff and the relationship environment of the centre.

Recommendations

1 There is a need for a Ministry of Education led review of teacher training programme, to ensure that the science of pedagogy and care is adequately taught in pre-service qualifications.

2 There is a need for pre-service and in-service training in health science, ergonomics, design and self-care.

3 There is a need for pre-service and in-service training in brain development and neuroscience, including relationships, secure attachment and health socio-emotional states conducive to learning and enjoyment of life.