Actions to further surveillance of physical activity among Australian children and adolescents: a rapid review

A Bauman
T Okley
J Salmon
L Hardy

saxinstitute

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Contents

Section 1. EXECUTIVE SUMMARY

The National Partnership Agreement on Preventive Health requires that jurisdictions report against set benchmarks by 2013/2014; one such benchmark is a set of targets to increase physical activity levels among children and youth (ages 5–17 years) in Australia. The target is at least 60 minutes per day of moderate to vigorous physical activity for children.

This report identifies and discusses candidate measures, with the Australian School Students Alcohol and Drugs Survey (ASSAD) short questions being available for most jurisdictions to 2008, and through synthetic modelling, estimates can be interpolated for jurisdictions with missing data. An alternative survey system, the National Secondary Students' Diet and Activity (NaSSDA) Survey provides 2009 data but may not be available in as timely a manner.

Additional technical research work will be required to develop and test a proxy-parent ASSAD question for computer-assisted telephone interviewing (CATI) mode of administration for children 5–11 years; this will include reliability and validity testing. For the 12–17 year olds, if the school based ASSAD surveys are maintained, then a parallel system of surveillance will need to be developed for these two age ranges. If the 12–17 year olds are to be surveyed by CATI mode in 2013 and 2014, then a large inter-method calibration study will be needed to demonstrate that the population rates of achieving the physical activity guideline are similar among 12–17 year olds; in addition, reliability and validity testing will be required, as the CATI mode will be new in this age group, and the measure is of unknown reliability and validity when administered in this manner.

Section 2. Overview of questions, methodological approach and scope

This report builds on recent reviews of physical activity (PA) for surveillance among Australian children and adolescents. The background, an overview of PA measurement methods, and an examination of the different surveillance systems in Australia have been previously reported (Bauman Report 1, Feb 2010[1], PHIDG reports).

Benchmark estimates are required for the National Partnership Agreement on Preventive Health (NPAPH) that define the prevalence of 'sufficient PA' levels for children and adolescents aged 5–17 years for each jurisdiction. The guideline for PA among children and adolescents in Australia is "*the proportion participating in at least 60 minutes of moderate-vigorous physical activity (MVPA) every day*". The NPAPH defined benchmarks are to increase this in each state and territory from June 2009 levels, by 5% by 2013, and 15% by 2014.[2]

To date, there has been a notable lack of comparable questions regarding PA surveillance measurements among children and adolescents aged 5–17 years used across the jurisdictions. Current jurisdictional surveillance systems use different questions and modes of data collection, so that the estimates of children's PA that meet the benchmark/guideline vary widely (with estimates from around 7% to over 70% meeting the guideline), with all surveys using representative samples, but different questions and modes of administration (see Report 1).

This review extends the recommendations in Report 1, and provides more specific advice to achieve comparability in how the physical activity benchmark is measured across jurisdictions. There are four sections that answer the specific requests in this proposal:

1. Overview of methodological approach
2. Method to estimate baseline physical activity using existing data
3. Method to measure and monitor children's physical activity using existing infrastructure and
4. Advice on approaches to assess the accuracy of the measurement.

Background to this work

This report has been commissioned by the Sax Institute to further advise the NPAPH Implementation Working Group (IWG) on the next steps required to reach agreement on a nationally consistent baseline measure and provide definitive advice on the measurement and monitoring of PA for children aged 5–17 years for the purpose of reporting against the performance benchmark set out in the NPAPH.

The findings of Report 1 were presented to the National Implementation Working Group meeting on 17 February 2010. Following that meeting this report has been commissioned to provide further concrete and technical advice on the following:

[Section 3 of this report]

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[1] Henceforth known as 'Report 1'.

[2] Measurements to be compared against the benchmarks will be data collected in June 2013 and December 2014. The proposed timeframe specifies a per cent change, and the metric of relative change is intended here. This has implications for the sample size required. Considering relative change, and given a hypothetical baseline rate of 20% meeting the guideline, the follow up increases of 5 and 15% relative increase imply the following change in prevalence: 5% of the 20% meeting the guideline at baseline is a 1% absolute increase to 21% by 2013; a 15% relative increase is an increase to 23% of the population of children active by 2014. This latter [relative change] method is more achievable, but at the cost of requiring a very much larger sample size to detect it. Given a power of 0.8 and an alpha error of 0.05, a very large sample, perhaps over 4000 surveys per jurisdiction may be required to detect the change from 20% meeting the threshold to 21% meeting the threshold. For the 2014 estimate of 15% [relative] change - this would require around 500-750 per jurisdiction to detect a prevalence difference in the benchmark between 20% to 23%.

A method to provide estimates of 2009 baseline children's PA participation using existing data including:

- The status of ASSAD[3] data as can be drawn from available PHIDU and any further work needed to access key data. ASSAD appears to be a potential candidate for this purpose[4]
- Recommendations on optimal modelling method to derive acceptable [and synthetic] baseline estimates for all jurisdictions for all age groups
- Expert advice about the reliability of estimates that will be modelled by jurisdiction and age group.

[Section 4 of this report]

A method to monitor children's PA participation for ongoing reporting using existing data capture infrastructure (i.e. CATIs) including:

- A recommended method for monitoring change against baseline using existing data infrastructure (e.g. use of CATIs to ask specific ASSAD PA questions by parental proxy)
- Technical advice regarding optimal measurement techniques (e.g. individual self report vs. parental proxy) to improve the accuracy of the measurement for the full age range (though models may well use different measures for subgroups e.g. 5–11 years, 12–17 years)
- Overall advice about the reliability of estimates that will be produced by the methods proposed by jurisdiction and age group.

The methodology used in this report has included reflection and expansion of the information provided in Report 1 for the more specific purposes sought here; assembling an expert group (with national level expertise and recognition in PA surveillance for children and adolescents); considering the specific questions asked, and reflecting on the literature, the evidence base, and the feasibility and methods for achieving the benchmarks and data collections proposed. All authors examined and considered the report, and contributed to specific parts of it, especially where they had specific expertise, content understanding, or contacts to whom they could address relevant questions.

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[3] Note: the acronym ASSAD is not preferred by all states; in NSW, this is known as the Secondary Schools Health Behaviour Survey (SSHBS), but its historical origins are in the ACCV Australian Secondary Schools Alcohol and Drugs surveys [which asked mostly about tobacco etc] but in recent years has added questions including on PA [this question is used in HBSC surveys across Europe, and was validated by Prochaska 2001 – hence these terms refer to the same PA question].

[4]Consideration can also be given to the use of NaSSDA data, which was mostly collected in 2009, but it is unlikely to meet the timing requirements, as data are not to be analysed until October 2010, and the following plan NaSSDA surveys are scheduled for 2012. If this were to become a biennial survey, then it could provide estimates for 2014 as well – this information needs to be sought from the Anti Cancer Council of Victoria, the lead agency for NaSSDA.

Section 3. A method to provide estimates of 2009 baseline children's physical activity participation using existing data

Data coverage: this task is to review the candidate measures for surveillance for children and adolescents that might provide a comparable baseline benchmark for 2009, and could potentially provide follow up estimates in 2013 and 2014/15. Identify the status of the Australian School Students Alcohol and Drugs (ASSAD) Survey and the National Secondary Students' Diet and Activity (NaSSDA) Survey measures as candidate measures for this purpose.

ASSAD is the short format question(s) derived from the European Health Behaviour in School-aged Children (HBSC) surveys, and was asked in most Australian jurisdictions in 2005 and in some jurisdictions in 2008 as part of the secondary school drug and alcohol school based surveys overseen by the Anti Cancer Council of Victoria (ACCV). This is a slightly complex picture, as NSW had asked an earlier version of this measure in 2002; NSW, South Australia (SA), Victoria, Queensland, Northern Territory (NT) and Tasmania asked the PA core question in 2005, and in 2008, NSW, SA, Queensland and Tasmania repeated the PA questions they asked in 2005.

Although few jurisdictions have published these data, some useful lessons emerge. First, a careful examination of NSW data shows trends in the prevalence of meeting the guideline of at least 60 minutes daily of moderate activity between 2005 and 2008 – this indicator changed very little (from 13.2% to 13.3%). Using synthetic modelling to compare the earlier 2002 survey, we can obtain reasonably comparable estimates for '5+days of MVPA' from NSW data in 2002, 2005 and 2008; these estimates show negligible change (33%, 32.8%, and 34% respectively).[5] This raises important questions; is the benchmark measure sensitive enough to detect change, responsive to change, or is it actually difficult to achieve substantive change?

Data from European countries have shown the original HBSC measure to be responsive to change in countries where interventions have been extensively implemented (Samdal 2006; Currie HBSC 2008), so this suggests the indicator can be responsive to change over time in many cultures, and is suitable as a surveillance tool. The ASSAD measurement is reliable in large studies (Prochaska 2001). Therefore, the second interpretation of these trend data is that NSW might not have made significant progress during these years. This poses challenges for the achievement of the proposed relative change targets (5% and 15% by 2013and 2014 respectively).[6]

The next consideration is the potential use of NaSSDA data, a national PA and nutrition survey carried out in secondary school students; the study was carried out in 2009, and completed in NSW in 2010. NaSSDA used the Prochaska measure (HBSC short measure) to assess compliance with PA recommendations. It also used APARQ (Adolescent Physical Activity Recall Questionnaire, NSW SPANS report 2004) to assess physical activity in a more comprehensive way.[7]

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[5]Note that these are the reported estimates for NSW; they reflect the NSW Health Department reported and published data, '60 minutes, 5 days per week', and not the current guideline of 'daily 60 minutes', therefore additional analysis of the raw data could easily be carried out to assess the actual trends in the 60 minute indicator, but is beyond the scope of this proposal. The trends would be very similar in the daily 60 minutes prevalence measure, so the point here is that if change is small, then it will be harder to detect in serial surveys.

[6] Note that the magnitude of the relative change targets depends on the synthesised baseline national estimate that is finally derived. Earlier we used a 20% baseline as an estimate, but only reanalysis and synthetic modelling of the ASSAD data will allow a more accurate estimate of these 2013 and 2014 targets.

[7]In addition, the ASAQ (Adolescent Sedentary Activity Questionnaire) is used to assess compliance with national small screen behaviour recommendations [but that is beyond the scope of this report, as that indicator is not defined as essential for this NPAPH monitoring].

Data were collected among adolescents from Years 8 to 11[8] (second through fifth year of secondary school) in 2009 in all jurisdictions except NSW (where it was collected in the first half of 2010). The sample size for NaSSDA will be approximately 13,800 students, with collection of NSW data almost finished (NSW approximately 3,200; and other jurisdictions, data collection already completed in 2009, with the following sample sizes: Victoria 2,868; Queensland 2,846 ; Western Australia (WA) 1,491; SA 1,282 ; Tasmania 837; ACT 768, NT 541). These data will be analysed and reported to the funders [ACCV and the National Heart Foundation (NHF)] by the end of October, 2010. The data are smaller than the benchmark 2008 ASSAD by jurisdiction, and would require calibration for estimates for year 7(12 year olds), but are closer to the optimal 2009 year (where most of NaSSDA were collected). Follow up NaSSDA collections are scheduled only for 2012. The PA measures in NaSSDA include the same measure as the ASSAD instrument (HBSC question) and also the more detailed APARQ measure, but the latter, based on NSW Schools Physical Activity Nutrition Survey (SPANS) data using APARQ, shows a higher prevalence rate of meeting the PA guideline for children aged 5–17 years [see figure 1, Report 1].[9]

Modelling: methods to estimate baseline physical activity using existing data: explore ways of defining a synthetic baseline 2009 estimate, including extrapolation from existing data to provide 'synthetic baseline' estimates for jurisdictions without 2008 ASSAD data, indicate the data required, and estimate the reliability of the models generated.

'Synthetic modelling' is a rarely used term in public health and has various meanings. The few occasions where its use has been consistent is in small area analysis, where multiple areas have reported data, and some areas have missing data, and values are estimated by interpolation for those regions (Scarborough 2009; Edwards 2009). For the purpose of this establishment of baseline 2009 data for children's level of PA, two kinds of synthetic modelling situations might occur:

[i] When there are data at an earlier time point – specifically Victoria has data on ASSAD for 2005, but not 2008. Here the approach should be to ascertain trends in other states (analyse the data for other states 2005 to 2008, as is shown earlier in this report for NSW); if rates in other states show no or negligible change 2005 to 2008, then the Victorian data can be brought forward (the 2005 estimate used as the 2008 estimate for a Victorian 'baseline'). If the data in other states has changed 2005 to 2008, then that relative change could be ('synthetically')applied to 2005 Victorian data to approximate a 2008 baseline.

[ii] The more complicated situation is where data are absent – for ASSAD, there are no data for WA. There are no synthetic modelling rules here, as usually a cluster of similar regions can be used to generate the 'missing region's estimate'; however, there are only a handful of jurisdictions, so this method is not feasible. The next method is pragmatic, but may be all that is possible. First, an identical youth PA estimate needs to be obtained for WA and for the rest of the country; then, the relative difference can be observed. This could be from the National Health Survey (NHS), from Exercise Recreation and Sport Survey (ERASS), or from Kids Eat, Kids Play 2007; in addition, exactly comparable data on PA are collected by all jurisdictions on older adolescents aged 16–17 years, for example in the NHS. Ideally all these data sources would be used (to triangulate the relative difference estimates between jurisdictions) – if these were roughly concordant, say WA 12–17 year olds were 1.15 times as likely to be active across these other surveys compared rates of PA to all other jurisdictions, then this weighting could be applied to estimate an approximate

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[8]Note that ASSAD was collected from years 7–12 in NSW, and this covers age ranges 12–18 years, that includes the 12–17 years sought for this benchmark [this age range for sampling is documented in the NSW published reports, and is likely elsewhere but remains to be confirmed by ASSAD collected other jurisdictions]. The NaSSDA survey covers school years 8–11, which omits year 7 (age 12), and if NaSSDA were used, this would require imputation of year 7 values; this should be possible to estimate using the ASSAD data comparison of year 7 and 8 rates.

[9]Note however that APARQ has shown responsiveness over time (in NSW) - SPANS 2004 reported on the changes in PA from 1997 to 2004 using APARQ which showed significant increases in prevalence rates over this time among adolescents in Years 8 and 10 in Summer (less clear in winter) (Hardy et al 2008 MSSE).

WA synthetic baseline for ASSAD in 2008.[10] The purpose of this data triangulation is to increase the reliability of the estimates derived; it is likely that this method will improve the capacity of synthetic interpolated models to produce more accurate data for jurisdictions with no data or with data that was collected at an earlier time point and a 2009 estimate needs to be derived.

An important consideration is that this baseline estimate will be derived 'synthetically' to interpolate estimates from some jurisdictions; the follow up collections in 2013 and 2014 would be real data collections that should ideally use the same sampling frame and survey method (as the majority that had real data at baseline) for comparability of estimates.

<u>Summary and recommendations:</u>

Possible surveys to measure child and adolescent physical activity

Both the ASSAD short format questions and those used in the NaSSDA survey are feasible measures of 12–17 year olds PA participation that could be used for surveillance, and provide estimates relevant to the required NPAPH indicator.

While the NaSSDA survey can provide national 2009 baseline data, with a follow up national survey planned for 2012, at this stage it will not provide 2013 and 2014 data. Negotiations would be required with the ACCV and NHF in order to access 2009 data and additional funds would be required to conduct 2013 and 2014 surveys. Thus the ASSAD short form questions survey represents the preferred option over the NaSSDA survey.

Physical activity baseline measures for children and adolescents

It is possible and feasible to estimate baseline data for the children's PA indicator where earlier time point data are available, and where trend data are available for surrounding regions. Data will need to be interpolated for missing years and for the missing state (WA) that does not have ASSAD data. This baseline is derived from school-based surveys.

Though there is no universally accepted method, it would be feasible to generate a 'missing jurisdiction' estimate where data are absent for a particular jurisdiction. This type of modelling would include triangulation of other secondary data sources within and across jurisdictions in order to provide the interpolated estimate for the missing region. Though feasible, this synthetic modelling will require access to all the data sets specified, and in addition sufficient analytic time. The time required and cost of undertaking this analytic work is currently not known. A logical step forward here is to compare this approach with the costs and strengths/weaknesses of other approaches presented later in this report, and make a decision based on the time and resources required, and the acceptability of these approaches to the jurisdictions.

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[10]Note the 2008 ASSAD data are used as the 2009 estimate, as they provide the closest data collection to the 2009 nominated year

Section 4. Methods to measure and monitor children's physical activity using existing infrastructure

Define the methods and required additional measurement research to monitor change against the baseline; this will include the development of estimates for 5–11 year old children[11] and for 12–17 year old adolescents. Identify the measurement techniques [self report versus parental proxy] and the infrastructure required for data collection for monitoring change against baseline levels. Make recommendations on the kinds of questions that could be adapted to a parental proxy format.

This section considers the modes of measurement, and the tasks required for the two age ranges. These age groups are differentiated by school situation (mostly being in primary and secondary school respectively).[12] The tasks for 5–11 year olds are made more difficult because of the lack of reliable self-reported information being provided by students in this age range.

As discussed in Report 1, proxy reporting usually by parents or carers are acceptable, if not perfect, ways of measuring PA for this age group (Dollman 2009). There are some technical issues to consider. The mode of delivery for adapting and delivering proxy-reporting parental ASSAD questions is most feasible via CATI-based phone interviews or household interviews. In addition, if ASSAD questions were used, there would be no baseline for 2009 for this 5–11 year old age group, and no synthetic modelling could be designed to retro-fit an estimate based on responses to these questions by older adolescents who responded in 2008 to ASSAD.

An important methodological question is whether similar proxy-based estimates of PA would be obtained compared to those that would be obtained if a representative population of 5–11 year olds were sampled through schools and their parents contacted for proxy-interview (the likely answer is 'yes', and this does not need to be tested).

Second, and more substantial as a problem, does the mode of questionnaire administration matter? This proxy reporting via CATI would be a completely separate estimate to that obtained through CATI by school based surveys through ASSAD self-report for 12–17 year old students. Ideally, these two age-group estimates of the PA indicator would need to be kept separate, with school based ASSAD maintained for 12–17 years, and parental-proxy measurement by CATI survey for estimates of 5-11 year old children. This would still allow progress to be monitored towards 2013 and 2014 targets for the older group compared to a school-based ASSAD benchmark in 2008.

An alternative would be that the 12–17 year old secondary school children be also approached by CATI, and then both 5-11 and 12–17 years samples would be surveyed the same way in 2013 and 2014. The problem with this approach are that 12–17 year old students may respond differently via CATI, compared to anonymous de-identified school based surveys.[13] In addition, there would be no baseline for either age group for 2009. This would be likely to be the most expensive option as it would require substantial work.

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[11]ASSAD is asked in secondary school surveys, as a self-report instrument, and excludes 5–11 year old school students; among this younger age group, self report is not consistent or reliable, so that parental proxy report methods need to be developed [see Report 1].

[12]For example, the ASSAD surveys and the NaSSDA surveys specifically target 12–17 year olds, and are conducted exclusively in secondary schools (although in some jurisdictions, primary school is 7 years duration, and in those jurisdictions, many 12 year olds would be in primary school).

[13]And this would require inter-method validation work to ensure comparability

There is a moderate amount of technical work required just to develop the 5–11 year old parental proxy measure. These include the proxy report items that have been developed for the NHS by Professor Jo Salmon, and they are designed to be interviewer administered for the NHS (by CAPI or CATI surveys). They have been modified from the Prochaska (ASSAD) measure [see Report 1, the Prochaska measure a reference to the validation study of the ASSAD measure]. This measure is referred to below as the "parental-proxy ASSAD" measure. In addition, the sedentary measure by proxy is shown as a footnote.[14]

Parental-proxy report ASSAD physical activity questions for 5–11 year olds

Q01. On how many of the past 7 days did your child participate in sport, physical activity or active play for a total of at least 60 minutes? Some examples include playing soccer, netball, basketball, rugby league or union, Australian Rules football, swimming, walking or riding a bicycle to or from school, skipping, running, rollerblading, dancing or any activity that made your child huff and puff.

[Read: Please add up all the time your child spends in physical activity each day] Days ____

This parental-proxy ASSAD question has not been used in any population surveillance systems in parental proxy reported format. It is different to measures used for parental proxy in the NHS/ABS surveys or in the ERASS survey organised through the Sport and Recreation sector, and currently collected in some jurisdictions. It will not be possible to use approximate modelling from those existing questions collected in 2009; a new and specific CATI data collection would be needed for 2010 to act as the baseline for the parental-proxy ASSAD question. The other questions (NHS, ERASS) may provide baselines, but they will not be comparable to the ASSAD secondary school data, and it is methodologically more complex to use estimates from different sets of questions for different age ranges (5–11 and 12–17 years); hence the recommendation above is for identical measures in separate surveys, ASSAD and parental-proxy ASSAD, as the question comparability is of more importance in PA surveillance than the non-comparable baseline years (2008 for ASSAD, and as proposed here, 2010 for parental-proxy ASSAD for younger children).

If this were to proceed, a CATI survey sample of the parents of 5–11 year old children should be initiated in 2010 as the benchmark estimate for this age group, with a sufficient sample size for jurisdictional comparison (minimum sample size 600 / jurisdiction), or by gender within this age group by jurisdiction (1200 / jurisdiction). In addition, measurement testing of this measure for reliability and validity would be needed (see section 5).[15]

Feasibility of ASSAD incorporated into CATI surveys for monitoring PA amongst 5 to 17 year olds; advice on ASSAD to supplement CATI survey methodology to provide additional reliability for ongoing data collection points.

Note that the above discussion has recommended a split system for surveillance, with the ASSAD being collected in school based surveys for 12–17 years by self report, and the 5–11 parental-proxy ASSAD collected by CATI.

This section considers the feasibility of the incorporation of ASSAD questions in follow up surveys 2013 and 2014 into both ASSAD 12–17 year old responders, and parental-proxy ASSAD for 5–11year old responders.

The ASSAD questions could be asked in CATI format (see previous section), but changing the mode of administration could change the prevalence estimates, influence reliability and validity,

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[14]*Q02. On how many of the past 7 days did your child watch TV/ videos/DVDs or play video or computer games for entertainment for less than two hours? [Read: Please add up all the time your child spends watching TV/ videos/DVDs or playing video or computer games each day] Days ____*
[15] Note this would have cost implications, especially for smaller jurisdictions without a CATI system available.

and would remove the existing 2009 baseline (data from 2008) from consideration for 12–17 year old students.

If this method, using only CATI were essential, then an inter-method validity study [calibration study] would need to be conducted between ASSAD estimates from school based surveys and population estimates from CATI based surveys; this would require large samples to be accrued that were at least of 'population representative' size, (n=600-1000 students) using both methods – using a school based survey method as is currently employed for the ASSAD 2008 data, and separately (on an independent sample of adolescents) accrue the same size sample from CATI, and then compare these two population estimates of meeting the PA indicator. Algorithms to calibrate different methods of the same questions asked in different modes are possible,[16] and provided the differences were not too large, an adjustment factor could be then applied to 2008 school based ASSAD to estimate the CATI prevalence at that time. In addition, reliability and validity testing for ASSAD in CATI mode would be required (see section 5).

In this model, there would be a combined data collecting system using CATI for the 12–17 year old group, and CATI for parental proxy reporting of PA among children aged 5–11 years, provided that this method was examined and its measurement properties known. Then both samples would be collected by CATI for 2013 and 2014.

<u>Summary and recommendations</u>:

It is feasible for a modified ASSAD (Prochaska measure) parental proxy to be developed and tested and used to measure PA amongst 5–11 year olds by telephone interviewer administration in 2013 and 2014.

A national parental proxy baseline is not possible through synthetic modelling from available data for 2009, and such a baseline would need to be collected by CATI in 2010.[17]

It is recommended that the measurement properties of the parental-proxy ASSAD be tested prior to the baseline CATI survey in 2010, to ensure its measurement quality was suitable for surveillance by CATI in 2010 and in 2013 and 2014 for the 5–11 year old group[18] (the specific measurement tasks are described in Section 5 paragraph 4 page 14).

It needs to be determined if the 12–17 year old surveys for follow up would be school-based surveys as the 2008 data were, or CATI based.

- If CATI-based, then a large inter-method (i.e. school and CATI based) comparison of prevalence (of the 60mins/day indicator) would need to be conducted among those aged 12-17 years. If variations in validity and reliability between modes of administration were negligible for the ASSAD questions amongst 12–17 year olds, it is feasible for ASSAD questions to be administered by telephone based CATI administration in 2013 and 2014

- If the 12-17 year olds used school-based ASSAD data collection methods, then no additional work would be required for that instrument. This would imply two parallel data collecting systems using CATI for parental proxy reporting of PA among children aged 5–11 years, and ASSAD school based surveys for 12–17 years, and would be the recommended option from a methodological perspective.

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[16] But infrequently used in PA surveillance, as different modes may affect the estimates for known, and of more concern, for unknown reasons [unknown confounding]; but this is possible, and is occasionally done by jurisdictions interested in surveillance.

[17] As mentioned earlier, this is an expensive option; it is feasible at some cost. A cheaper option that is recommended is to discuss ASSAD future surveys with ACCV, and ascertain if they will occur (as opposed to being replaced completely by NaSSDA); if so, can the timeframe work for these benchmarks, as school based surveys, with no need for a special baseline collection.

[18] Work relevant to this reliability and validity could be proposed by ABS as part of the NHS development – information to be confirmed.

Section 5. Advice on assessing the accuracy of measurement & any additional studies needed

Technical advice regarding optimal measurement techniques (e.g. individual self report versus parental proxy) to improve the accuracy of the measurement for the full age range (though models may well use different measures for subgroups e.g. 5–11 years, 12–17 years).

There is potential for CATI collected proxy measures to be used for 5–11 year olds, to create a parallel data set for this age group. The minimal sample size (in statistical terms for a whole group, to provide sufficient accuracy) is probably at least 600 randomly chosen individuals; for a further breakdown, for example by gender, twice this number is required. The question here is whether estimates for all age groups (by calendar year) are required, or by gender, and for each jurisdiction separately (this will increase the required sample size). In addition, the effect size to be detected (difference to be detected) will markedly affect the sample size, with a larger sample size needed to detect the relative per cent change proposed by 2013 and 2014. Worked examples are shown earlier in this report. The same issues apply to 12–17 year old adolescents, and the same sample size requirements are relevant. The samples required for a CATI survey may be marginally (very slightly) smaller than for a school based sample, as the latter are likely to be clustered (but the difference is likely to be small).

The measurement development work for 12–17 year old students for the ASSAD surveys are described above, if the CATI system is mandated for follow up surveillance in 2013 and 2014. Inter-method prevalence comparisons will be required, to calibrate the CATI system against ASSAD estimates. Work will need to be done on the measurement properties of the CATI based parental proxy format of this instrument for 5–11 year olds, also discussed above[19] and also for the 12–17 year olds if CATI is used for this age group.

Topics for sub-studies and other techniques to assess the reliability and validity of measurement across jurisdictions of the agreed NPAPH children's PA measures; elaborate on ideas raised for the third tier of measurement of Report 1 regarding future sub-studies / R and V; describe research questions, timelines (when needed by; how long it would take to do the study); initial ideas on study designs and expected benefits from the studies.

This is additional to the measurement tasks described above for ASSAD (if CATI is mandated) and for 5–11 year old parental-proxy ASSAD.

There have been numerous reliability & slightly fewer validity studies to confirm the accuracy and repeatability of children's self-reported (in over 10 year olds) and parental proxy reported PA. For testing the validity of a specific instrument (like ASSAD by parental proxy and by self-report) for measuring PA recommendations it would be ideal to have a criterion measure, such as an accelerometer, which could be worn for at least 7 consecutive complete days. Then administer the self- or proxy-report measure at the end of that week.[20]

Any test-retest reliability measurement should be performed with a 3–4 day gap so that there is some overlap in the assessment of PA in the previous 7 days.

In terms of numbers, at least 50 in each age group would be ideal (i.e. 50 in the younger age group 5–11 years and 50 in older secondary school age group 12–17 years). These could be in convenient samples of children / parents, and are not necessarily representative samples, but should have some variation by age, gender and socioeconomic status/ region. This is needed for

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[19]This may be happening at present through ABS, who are piloting this question or a variant of it, for the 5–11 year old age group for the proposed NHS PA and diet survey – this needs further verification.

[20]The validity of the self- or proxy-report instrument for assessing compliance with Sedentary Behaviour recommendations could be validated against a 7 day log book (with accelerometers here as a secondary measure).

both age groups if CATI is considered for the older 12–17 year group, as both reliability and validity will need to be ascertained for the CATI method.[21]

This reliability and validation study could be completed and analysed in 6 months, but is a high-level technical research undertaking (would require substantial expertise).

Summary and recommendations:

That clarification be sought regarding whether the sample size required for the follow up surveys is needed at the whole population, or the jurisdictional level.

- If jurisdictional level, then the minimal sample size is 600 for a population estimate per jurisdiction for each age category (5–11, and 12–17 separately). However, to detect a small absolute change (relative change of 5% to 2013) will require a much larger sample size to detect it.

For the parental-proxy ASSAD measure for 5–11 year olds, a reliability and validity study should be conducted with 50 students; if the ASSAD 12–17 year olds measure is used by CATI, a large inter-method calibration study should be undertaken, and in addition, a reliability and validity study of 50 students should be undertaken.

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[21]To restate (so as to avoid confusion, this is in addition to the large inter method prevalence calibration study proposed to assess if CATI population estimates for ASSAD are similar to school based ASSAD estimates, see Section 4 page 12).

Section 6. Conclusion and final table of options

This report has made recommendations and suggested courses of action against each area of work. This conclusion is simply a distillation of the key questions, and the areas for discussion outlined in brief to guide the next stages of the deliberation on children's PA surveillance. Then there is an options table to conclude the report describing the specific options for indicator surveillance.

- The use of ASSAD or NaSSDA needs to be explicitly discussed, or whether neither of these are feasible as an indicator (however, in the opinion of this review they provide the best potential given existing data sets).

- The work required for synthetic modelling for ASSAD in secondary schools needs to be discussed; it is elaborated in detail in this report; this needs to be compared with the work required to use NaSSDA, and the time and costs of additional data collection.

  - This task is tied to the decisions about mode of administration in secondary school aged students – school based or CATI ?

  - This report had a preference for retaining school based measures, and having parallel split surveillance of 5–11 year old children and those aged 12–17 years, but methods were provided for CATI use of the ASSAD if an inter-method calibration study were conducted, so that ASSAD 2009 (collected 2008) data could be used as a benchmark and be followed by 2013 and 2014 CATI collections. The CATI measure for adolescents would also need reliability and validity testing.

Regarding the decisions around 5–11 year old children, the recommendation about ASSAD be revised and adapted for a parental proxy mode, and then tested in CATI systems discussed in the report. Adaptation or synthetic modelling from other current survey-based parental proxy measures is not recommended, given differences in those questions. The next steps are getting this parental-proxy ASSAD measure piloted and tested for reliability and validity, and then obtaining a 2010 population benchmark through CATI to represent this age group.

Final section. Options for physical activity surveillance in children

The table presents the options, a summary of the discussion in this report. The ASSAD short format questions provide feasible measures of 5–11 and 12–17 year olds levels of PA participation that could be used for surveillance, and provide baseline estimates required under the NPAPH indicators. The table focuses on the different age ranges and summarises the options that are presented in detail in the report. The table presents the tasks required for options 1 and 2 below.

Option 1 – consider both age groups, 5–11 years and 12–17 years for indicator[22]

  a) *Both collected by CATI at baseline and 2013 and 2014*
  b) *12–17 years collected by school-based survey [2008 baseline] and CATI in 2013 and 2014*
  c) *12–17 years collected by CATI at 2010 baseline and in 2013 and 2014*

Option 2 – only consider 12–7 year olds for the indicator (b or c in option 1 above without the 5–11 year old CATI based parental proxy)[23]

Option 3 – do not measure this indicator.

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[22]Note- options 1 (b) and 1 (c) imply a baseline through CATI surveys for the 5–11 year olds using parental-proxy measure.
[23]This is logistically simpler than Option 1, but has the concern of omitting 5–11 year olds; it may be possible if resources are limited, but this would need to be discussed across jurisdictions as an acceptable simpler indicator.

Table Summary of options

	5–11 yrs children	12–17 yrs adolescent
Baseline	*Background: It is not possible to model estimates for 2009; a new measure will be needed to monitor this benchmark indicator* • New survey in 2010 using CATI-based survey using parental proxy measure [of an adapted version of the ASSAD measure] is the only option to create a baseline • Would need to be national survey with appropriate state sample sizes[24] • Would require prior technical work to test validity and reliability of measure[25]	*Background: Possible to construct baseline consistent with policy intent of benchmark using ASSAD (2005/2008) or NaSSDA (2009/10)* • If school-based ASSAD 2005, 2008 is used for an estimate, synthetic modelling needed to impute missing data[26] • If CATI-based, ASSAD would be measures in a 2010 survey, and a national and jurisdictionally representative sample required[27] • *Note that the alternative survey, NaSSDA has coverage of all jurisdictions, but ASSAD sample size (24,000) larger than NaSSDA (14,000) – more reliable estimates at jurisdictional level, and timing of NaSSDA follow up surveys would need to be arranged.[28]*
Ongoing measures	• Possible if parental-proxy ASSAD measure shows acceptable validity and reliability • Could be built into state CATIs for 2013 and 2014	• Two options for measurement vehicle: a) ASSAD/NaSSDA (school based) follow up surveys [maintain school based surveillance] b) Incorporate ASSAD question into state CATIs (methodological preference is for adolescents to respond themselves – i.e. CATI self report[29]) • Asking ASSAD question via school based estimates at baseline and CATI at 2013, 2014 would require a large inter-method comparison study and to calibrate prevalence rates by method.[30]

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[24]Sample size discussions are provided in the report, including the sample size needs based on the baseline estimate, and the difference to be detected.

[25]A potential parental proxy question (adapted from the ASSAD question) to be tested is provided in the report.

[26]This synthetic modelling is discussed in detail in the report, and is needed because ASSAD data only available for all states except WA in 2008 , and a subset of states in 2005.

[27]As well as an inter-method calibration study [comparing school based and CATI based prevalence rates for the indicator], if comparability with earlier estimates in 2005 and 2008 is required.

[28]Note that ASSAD is currently planned for repeat in 2011, 2014; NaSSDA in 2012.

[29]Better estimates are likely from self-report responses in this age group of 12–17years; if parental proxy were used for those under 15, it would need to be used at CATI baseline and subsequently, but is likely less valid than self-report; however the feasibility of CATI surveys of 12–17 year old students would need investigation, compared to parental responses on behalf of these adolescents.

[30]Note this is not required if the baseline for this age group is the CATI based survey 2010, as no inter-method calibration with school based surveys would be needed [as trends in the indicator would be compared to the 2010 CATI survey]; the methods for this calibration study are provided in the report.

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