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A-LEVEL

# Science in Society

SCIS4 Case Study of a Scientific Issue

Mark scheme

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2400

June 2016

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Version: 1.0 Final

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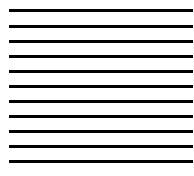
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Mark schemes are prepared by the Lead Assessment Writer and considered, together with the relevant questions, by a panel of subject teachers. This mark scheme includes any amendments made at the standardisation events which all associates participate in and is the scheme which was used by them in this examination. The standardisation process ensures that the mark scheme covers the students' responses to questions and that every associate understands and applies it in the same correct way. As preparation for standardisation each associate analyses a number of students' scripts. Alternative answers not already covered by the mark scheme are discussed and legislated for. If, after the standardisation process, associates encounter unusual answers which have not been raised they are required to refer these to the Lead Assessment Writer.

It must be stressed that a mark scheme is a working document, in many cases further developed and expanded on the basis of students' reactions to a particular paper. Assumptions about future mark schemes on the basis of one year's document should be avoided; whilst the guiding principles of assessment remain constant, details will change, depending on the content of a particular examination paper.

Further copies of this mark scheme are available from [aqa.org.uk](http://aqa.org.uk)

Question	Answers	Additional Comments	Mark
1	Very large data sets May be byproduct of other activities Linking more than one data set / collating data Not always numerical data (eg tweets, search terms) used to look for correlations	Any 2 for 1 mark each	2
2	Want the benefits of using apps - tracking exercise, counting calories, personalised ads Worth giving away data to get a 'free' app Don't think it will cause them harm so doesn't matter Might contribute to the improvement of the apps Data isn't linked to them directly altruism – improvement of healthcare generally		1
3	Can look at the issue without being strongly/emotionally/financially involved in the research. Wide range of experience – look at issues from different viewpoints Knowledge of subject that decision makers may not have. Provide benchmark for ethical behaviour focus on research / more time for research made available / accessible	'bias' needs explaining for mark	2
4	<b>For:</b> decision could affect patient's care – might miss cancer screening services ignored for their own benefit NHS should help prevent illness patients' illness NHS is free service so data should be available to government utilitarian approach – benefit society <b>Against:</b> personal choice should be respected – even if greater chance of illness betrayal of trust <ul style="list-style-type: none"> <li>• over-rode a carefully made decision</li> <li>• should have informed patients</li> <li>• patients told they could opt out.</li> </ul> erodes public trust more widely	avoid crediting a repeat of the stem	3
5	Companies purchasing user information Hackers breaking into system Healthcare workers leaking / misusing the data Anonymisation can be broken using circumstantial information (types of illness, dates of hospital visits)		2



6	<p><b>similarities:</b>                  long time scale                  variety of different records and test results                  large scale                  may collect data of some people from birth to death                  similar purpose – identify trends / improve healthcare</p> <p><b>differences:</b>                  ALSPAC is opt-in/ care.data is opt-out                  ALSPAC initially geographically limited / care.data covers all England                  Gender imbalance in ALSPAC (more mums)                  Different sources of funding (ALSPAC-RCUK, care.data – NHS)                  Care.data receives data that are collected from patients during routine practice / ALSPAC collects specific research data e.g. urine, hair, blood                  ALSPAC links family data.</p>	allow comparisons of scale with explanation e.g. care.data>ALSPAC due to geographical nature	4
7	many traits / diseases caused by number of genes environmental factors can affect gene expression can't control variables e.g. genotype or environment too many variables to identify obtain correlations, not causal relationships / mechanism  allow a mark for good example.	allow: 'people affected by environmental factors differently depending on their genotype' for 1 mark	3
8	<p><i>Data exhaust:</i>                  data produced from ordinary activities - web searches, mobile data</p> <p><i>Theory-free analysis:</i>                  looking for patterns/correlation in data without theory to explain them – no mechanism                  Lots of patterns investigated until statistically significant one occurs.</p> <p><i>False positive:</i>                  an incorrect conclusion is made about a customer.                  data could be interpreted another way / error or anomaly                  example e.g HIV</p>	consider in testing, when a positive result is given but the result is wrong - e.g. being pregnant, having a tumour, for 1 mark	6
9	sample population identified description of what/how sampled why not representative		3
10	HIV data needs to be released more frequently statistical techniques and software need to be updated/improved.		2

11	<p>Using data for purposes not intended no informed consent confidentiality / privacy potential harm from release of data</p> <p><b>Source D</b> private information that they don't want to share with family members. insensitive to women unable to conceive / miscarried insensitive to women with an unwanted pregnancy</p> <p><b>Source E</b> HIV has stigma attached Identifying people who don't want status to be known</p>		4
12	<p>Charity understand needs of people with cancer Charity uses data to improve patient care Charities have different perspective than university researchers People happy to have charities do work on data because it is for public benefit. influence policy</p>	answer taken from source	2
13	<p>So know possible funding sources Can take this into account when looking at conclusions Identify possible sources of bias Might be based at drug company.</p>	'bias' must be explained for mark	2

Question	Answer			Additional Comments	Mark
14					12
Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.					
0 marks	Level 1 (1–3 marks)	Level 2 (4–6 marks)	Level 3 (7–9 marks)	Level 4 (10-12 marks)	
	<ul style="list-style-type: none"> <li>• definitions poor or missing</li> <li>• poor examples or example missing</li> <li>• no attempt to be appropriate for audience</li> <li>• poor clarity of explanation</li> </ul>	<ul style="list-style-type: none"> <li>• definition of correlation – limited / no detail</li> <li>• Definition of causation – limited / no detail</li> <li>• Example for both</li> <li>• little attempt to be appropriate for audience</li> <li>• little clarity of explanation</li> </ul>	<ul style="list-style-type: none"> <li>• definition of correlation</li> <li>• Definition of causation</li> <li>• example(s) for both – probably SCIS based</li> <li>• attempt to be appropriate for audience</li> <li>• some clarity of explanation</li> </ul>	<ul style="list-style-type: none"> <li>• definition of correlation + some detail</li> <li>• 2 examples of correlation – one spurious/common factor, one actual</li> <li>• Definition of causation + some detail</li> <li>• Clear example(s) for both – probably SCIS based</li> <li>• Appropriate for audience</li> <li>• High clarity of explanation</li> </ul>	
<p><b>Examples of the points made in the response</b></p> <p>Correlation</p> <ul style="list-style-type: none"> <li>• when something happens only when a factor is present, then there is a correlation between the factor and the outcome.</li> <li>• positive correlation – both go up together</li> <li>• negative correlation – one goes up as other goes down (or vv)</li> <li>• often shown on a scatter graph</li> </ul> <p>But both could be caused by a third factor examples: leukaemia clusters, serotonin and mood, genes and behaviour</p> <p>causation</p> <ul style="list-style-type: none"> <li>• when there is a mechanism which provides an explanation of why a factor causes a particular outcome.</li> <li>• studies can be done which change a factor and look at the outcome.</li> <li>• studies have to show that differences in experiments are bigger than might be expected due to random chance.</li> </ul> <p>examples: high doses of radiation and cancer, sunburn and skin cancer, extinction of species leading to change in ecosystem.</p>				<p><b>Extra information</b></p>	

question	answers			extra information	mark	
15					12	
Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response.						
0 marks	Level 1 (1–3 marks)	Level 2 (4–6 marks)	Level 3 (7–9 marks)	Level 4 (10–12 marks)		
	<ul style="list-style-type: none"> <li>view given with simple support</li> <li>no reference to sources.</li> </ul>	view given <ul style="list-style-type: none"> <li>personal only</li> </ul> Justification supported by 1 sources  Counterargument  limited quality of structured argument	reasoned view <ul style="list-style-type: none"> <li>personal</li> <li>wider society</li> </ul> Justification supported by 2 sources  Counterargument (referenced to sources) <ul style="list-style-type: none"> <li>reasonable quality of structured argument</li> </ul>	reasoned view + justification <ul style="list-style-type: none"> <li>personal</li> <li>wider society</li> </ul> Justification supported by at least 3 sources and referenced  Counterargument (referenced to sources)  Good quality of structured argument		
<b>Examples of the points made in the response</b>				<b>Extra information</b>		
wider society <ul style="list-style-type: none"> <li>benefits the many, even though I might not gain</li> <li>useful for medical research</li> <li>examples from sources                             <ul style="list-style-type: none"> <li>source C - ALSPAC</li> <li>source E – targeting medical care in appropriate areas (HIV kits)</li> </ul> </li> <li>quicker/ more data to look for possible correlations in illnesses</li> </ul> personal <ul style="list-style-type: none"> <li>don't want to share my medical records</li> <li>can't be guaranteed confidentiality</li> <li>examples from source                             <ul style="list-style-type: none"> <li>source A – data sold for marketing purposes</li> <li>source B – database might be hacked</li> <li>source E – might find out about illness and not want others to know (HIV)</li> </ul> </li> <li>Want people involved in my care to know about me without having to take records again.</li> </ul>				<b>Can obtain L4 if argument is only in terms of wider society</b>		