

Household Telecommunications Expenditure in Australia

Robert Breunig*

Crawford School of Public
Policy
Australian National University

Owen McCarthy

Bureau of Communications and Arts Research
Australian Government Department of
Communications and the Arts

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Abstract

Using a mix of survey data from the Household Income and Labour Dynamics in Australia survey and the Household Expenditure Survey, we examine the changing nature of telecommunications expenditure in Australia in the period 2006-2015. We show that it behaves like a core necessity such as food. Households with youth or young adults spend more on telecommunications than other households. The elderly and disadvantaged groups spend less. We propose measures to identify low-income households with relatively high or relatively low expenditure on telecommunications. These measures can be used to identify households at risk of “telecommunications inadequacy” or “unsustainable telecommunications expenditure”.

Keywords: Australia, consumption, telecommunications expenditure, low-income households

JEL Codes: D12, E21, I39

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1. Introduction

The internet and mobile telephone communication have revolutionised the world in the last few decades. From being a novelty, they have become an essential element in daily life. Banking, shopping, studying, and interacting with ones' peers and family are now intimately tied to internet and mobile telecommunication. Even more importantly for low income individuals, accessing government programs, receiving benefits and accessing medical test results happen increasingly through virtual means. Digital inclusion, or the ability of all individuals to take advantage of the opportunities available through digital means, has become important for driving social participation, labour market participation, educational attainment, and health and wellbeing. Understanding the characteristics of those individuals who may face barriers to participation in the digital economy is essential for determining how to improve access to communications services.

In this paper we add to the quantitative evidence base available in the communications sector and identify areas for improvement in current data availability that would allow for a deeper understanding of issues from a policy perspective. We make three contributions. First, we look at expenditure patterns for telecommunications in Australia at the household level for the period 2006-2015. We document that telecommunications expenditure behaves very much like any other necessity. Expenditure as a share of income has been decreasing over time as costs fall. Second, we look at the relationship between household characteristics and telecommunications expenditure. As one might expect, there is a strong relationship between the age of household members and telecommunications expenditure. Households with youth and young adults spend more relative to their income and households with elderly individuals spend less. Conditional on income, disability, poor health, indigenous status, speaking English poorly and being an immigrant from a non-English speaking country are all associated with

yelowter than average telecommunications expenditure, while living in a remote or rural area and financial stress are associated with higher than average expenditure.

Third, we propose two new measures which could assist with the monitoring of two distinct groups who may face barriers to participation in the digital economy. The first is a measure of low-income households with high relative shares of disposable income spent on telecommunications. We define 'low-income, high spending' households as those households with telecommunications expenditure more than three times the median and household income less than half of median household income. These households are spending large amounts relative to their income and this may displace resources for other basic households needs. Of course, this may simply be driven by preferences of those households. We thus view the measure as a signal of potentially unsustainable behaviour rather than irrational behaviour on the part of the household. In as much as households are spending on telecommunications as a necessity to participate in societal interaction and access government assistance, this measure could assist with monitoring households whose expenditure on telecommunications services may result in limited disposable income left over for other purposes.

The second measure we propose is a measure of low-income households with low relative shares of disposable income spent on telecommunications. We define households with less than half of median expenditure on telecommunications who are below half of median income as 'low-income, low spending' households. This group is potentially at risk of not being able to enjoy a variety of benefits that come from being connected to society through telecommunications. If these households are spending so little on telecommunications that they cannot access government services and the benefits of connectedness, then this measure

could help with the monitoring of households who may be missing out on benefits associated with consuming telecommunications services.

Overall, we find that telecommunications services are becoming more affordable, but there are some groups for which expenditure may be unaffordable or who may be missing out on opportunities available through digital means. Data limitations mean that the two measures only identify a potential for unaffordable expenditure or a lack of participation in the digital economy. Additional information on the quantity and quality of communications services consumed and the preferences of consumers would allow for more precise measures.

In what follows, we briefly review the literature on telecommunications expenditure and discuss the Australian context. We then describe the data we use and the key patterns of telecommunications expenditure. Section 4 presents results from regression estimates relating characteristics to expenditure. Section 5 presents the measures of low-income households with relatively high or relatively low shares of disposable income spent on telecommunications. We conclude in section 6.

2. Background and related literature

There is a small but growing literature on telecommunications expenditure patterns. We begin by discussing a few papers and approaches from the international literature. We then turn to the Australian literature. We finish with a discussion of the Australian telecommunications policy environment.

Lee and Lee (2012) use panel data to document the rise in household expenditure on telecommunications from 1998-2008 in Korea. They estimate an almost ideal demand system

and show that telecommunications is a complement for transportation, books and cultural/recreational services and a substitute for cultural/recreational durable goods. They conclude that the migration of many services to online provision has driven increased demand for telecommunications services.

Barrantes and Galperin (2008), in a study of Latin America, show that telecommunications expenditure behaves quite differently in developing countries where it looks more like a luxury good than a necessity.

In Australia, there have been few studies of telecommunications expenditure. Many of these have focused on rural and remote areas due to concerns about poor access and limited connectivity in these areas. Madden and Coble-Neal (2003) gathered survey data to examine the demand for internet in rural and remote communities in Western Australia. They find that demand for access is largely determined by education and work requirements. They also find that among internet subscribers, a reduction in subscription price results in more time spent online.

In an early paper, Daley (2001) examines demand for, availability and quality of telecommunications services in rural and remote Australia. She finds that Australians in remote and rural areas are less likely to utilise internet and mobile phone services than Australians in urban centres. She finds inferior services in rural and remote areas relative to urban Australia but that government intervention reduces that gap.

The Australian Digital Inclusion Index¹ (see Thomas, Barraket, Wilson, Ewing MacDonald, Tucker and Rennie, 2018) uses survey data from an ongoing commercial market research survey to measure access, affordability and digital ability in Australia. A selected subset of questions from that survey are used by the Australian Digital Inclusion Index to construct affordability and other indicators. Their 2016 and 2017 reports find that affordability worsened between 2013-2014 and 2015-2016, but improved between 2015-2016 and 2016-2017. They find that access and digital ability improved over the entire period. They find that while the cost of data has dropped, households are spending slightly more money on internet services as a share of total household income. We note that our data only cover the period through 2015, however they have the advantage of being publicly available.

A working paper by the Bureau of Communications and Arts Research (2017) contains some analysis expanded on in this paper. The paper examines the affordability of communications services since 2006 and finds that the average share of disposable income spent on communications services has fallen since 2006 with most of the decline occurring before 2013. However, rural households and some vulnerable groups, including households where at least one member is not employed, has a long term health condition, or is Aboriginal or Torres Strait Islander, are identified as spending a higher proportion of their income on communications services than the average household. The paper also finds that the rollout of the National Broadband Network (NBN) has improved choice and reduced prices for rural and regional consumers.

The Australian Government has specific policies designed to increase access to telecommunications. One policy is the telecommunications Universal Service Obligation

¹ <https://digitalinclusionindex.org.au/>

(USO). This is a contractual and legislative obligation placed on Telstra, as the primary universal service provider, to ensure that standard telephone services and payphones are reasonably accessible to all Australians, irrespective of where they live or work. Under these arrangements, Telstra must also ensure these services can be accessed by people with a disability, as required by the *Disability Discrimination Act (1992)* (Cth). The USO is partly funded by the Australian Government through an annual appropriation of \$100m, with the remainder funded through industry contributions under the Telecommunications Industry Levy.² The Australian Government is currently reviewing these USO arrangements.³ The USO does not include a digital data service, but the Australian Government is providing access to broadband internet services through the rollout of the NBN. The NBN is expected to provide access to peak wholesale download speeds of at least 25 megabits per second to all Australian premises and at least 50 megabits per second peak wholesale download speeds to 90 per cent of the fixed line network when complete.⁴

A second policy is the “telephone allowance”—a quarterly payment to help with phone and internet costs which is paid as a top-up amount to several Australia government pension and income support programs. Payment eligibility depends on a range of factors.⁵ Individuals on Disability Support Pension, Newstart Allowance, Youth Allowance, Farm Household Allowance, Sickness Allowance, Parenting Payment, Partner Allowance, Widow Allowance or Special Benefit may be eligible depending upon age, disability status, caring responsibilities and partner’s characteristics. When an individual is eligible, the telephone allowance is simply

² See Productivity Commission (2017), p. 8.

³ See <https://www.communications.gov.au/what-we-do/phone/phone-services/universal-service-obligation>. Last referenced on 3 July 2019. Archived at <https://archive.org/web>.

⁴ See <https://www.nbnco.com.au/corporate-information/about-nbn-co/our-purpose.html>. Last referenced on 3 July 2019. Archived at <https://archive.org/web>.

⁵ See <https://www.humanservices.gov.au/individuals/services/centrelink/telephone-allowance>. Last referenced on 3 July 2019. Archived at <https://archive.org/web>.

added onto any other income support payments that an individual receives and no itemized account of it as a separate payment is provided to recipients. Further, individuals do not need to apply to receive telephone allowance.

3. Data

We primarily use data drawn from the Household, Income and Labour Dynamics in Australia (HILDA) combined with data from the Australian Census of Population and Housing (Census). The HILDA survey is a household-based panel study that collects information on respondents' economic and demographic characteristics. The wave 1 HILDA survey was conducted in 2001 and has been conducted annually since. The vast majority of data were collected through face-to-face interviews and a small fraction of the data were collected through telephone interviews. 13,969 people were interviewed in wave one from 7,682 households. The survey has grown slightly over time as all individual sample members and their children are followed. The sample was replenished in wave 11 with a top-up sample of 4,009 people added to the survey.

Beginning in 2006 (wave 6), HILDA respondents were asked about their expenditure in a wide variety of categories. We use the variable `_hxyt1ii` to measure telecommunications expenditure. This derived variable measures annual household expenditure on telephone rent, calls and internet charges for both fixed and mobile services. We use reported values and imputed values where there is no value reported. In the regression models, we control for whether or not the value was imputed. As telecommunications expenditure is based upon responses to the Self-Completion Questionnaire, the rate of missing values is slightly higher than in HILDA variables which come from the main questionnaire.

We use the unconfidentialised version of release 15 of HILDA and make use of data from wave 6 through wave 15. Our STATA .do files are available upon request.

We construct a measure of the share of expenditure on telecommunications by dividing annual telecommunications expenditure by total household disposable income.⁶ Total household disposable income provides the closest approximation to total household expenditure in HILDA.

We construct a measure of household equivalised income by dividing household disposable income by the square root of the number of individuals in the household. We drop any households where disposable income is zero or negative or where the expenditure share on telecommunications is less than or equal to zero or greater than or equal to one.⁷

Table 1 provides wave-by-wave sample sizes and mean and median shares of expenditure on telecommunications and food as well as mean and median values of household income. Figure 1 shows the evolution of the expenditure share on telecommunications and on food for comparison over the 10 years for which we have data. Figure 2a shows expenditure share by decile of equivalised household income for wave 6 (2006) while 2b shows expenditure share by decile of equivalised household income for wave 15 (2015).⁸ Taken together they show a strong picture of the nature of telecommunications expenditure and its similarity to food. They

⁶ We create disposable income by taking the HILDA variables `_hifdip-` `_hifdin`.

⁷ We drop 324 observations with expenditure share greater than or equal to one and 2,332 observations where expenditure share is less than or equal to zero. This represents 0.4 per cent and 2.8 per cent of observations, respectively. None of the conclusions change if we include the zeros—these results are available from the authors upon request.

⁸ The distribution for other waves is very similar and is available from the authors.

both exhibit a declining expenditure share over time consistent with increasing incomes over this period and small income elasticities which are generally observed for necessities.

Theoretically, necessities have small income elasticities which means that as incomes grow, a lower share is being spent on these goods. This reflects substitution effects dominating income effects. As incomes increase, people generally want to consume more of a good but they may not want to consume all goods in equal proportion. As incomes grow, we observe increased expenditure on necessities, but a decreased share of total expenditure as individuals/households substitute to non-necessities. The decreasing expenditure shares on food and telecommunications thus suggest that both are necessities.

Appendix Figure A.1 shows the evolution of telecommunications prices and food prices over the last 20 years in Australia. For telecommunications, in particular, flat or falling prices have also contributed to the decreasing expenditure share over time.

Figure 3 is created from the expenditure data in the Australian Bureau of Statistics Household Expenditure Survey (HES) for 2009-2010 and 2015-2016. For the HES data, we use a combination of all expenditure on fixed telephone accounts, internet accounts, mobile phone accounts and non-account expenditure on mobile phones and internet. We also provide internet and mobile phone expenditure shares separately. The expenditure shares are slightly lower than what is observed in HILDA – this may be due to the data being gathered in 14-day windows. However, the overall pattern that we observe in the HILDA data is also visible in the HES data. We see a large decline in expenditure share from the bottom to the top deciles of equivalised income for a variety of telecommunication expenditure items, although the decline is less monotonic in the lower and middle deciles in the HES data than in the HILDA

data. We also see expenditure shares decreasing over time when we compare panels a and b of Figure 3 consistent with rising incomes and telecommunications being a necessity. A notable exception is income decile 1 for which the expenditure share grew from 18 per cent to 24 per cent, reflecting faster growth in expenditure than incomes.

Figure 4 shows the expenditure share by decile of relative socio-economic advantage and disadvantage. We see some indication that telecommunications expenditure shares are higher in regions of lower socio-economic advantage but the differences are quite small. So the main differences, at least in the HILDA data, appear to be household-based rather than based upon the socio-economic status of geographic regions. There is almost no relationship with food expenditure shares.

Table 2 provides descriptive statistics at Wave 15 (2015) for the other variables (aside from the expenditure share on telecommunications and household income which are described in Table 1) used in the regression analysis below. The values for other waves are similar.

Table 3 compares the average share of telecommunications expenditure across a variety of categories in the data. This table is constructed by pooling all the waves (six through fifteen) of data. Standard errors for the comparisons are corrected for clustering. The ‘true’ column is the expenditure share if the household is described by the statement in column one and the ‘false’ column is the expenditure share for households for which the statement in column one does not describe them. A few interesting patterns emerge in the raw data.

Expenditure share is higher for the following categories:

- At least one member of the household is Aboriginal or Torres Strait Islander;

- All members of the household are immigrants (and even higher if all members of the household are immigrants from non-English speaking countries);
- Every member of the household speaks English poorly;
- At least one member of the household is under financial stress⁹;
- At least one member of the household is unemployed or not in the labour force;
- At least one member of the household has a long-term health condition;
- At least one member of the household is aged 65 or older;
- Every member of the household is aged from 15 to 30, inclusive;
- The household is in a rural area.

Expenditure share is lower for the following categories:

- Some, but not all, members of the household are immigrants;
- Some, but not all, members of the household are under age 30;
- At least one member of the household is aged from 31 to 64, inclusive.

These last three are consistent with the curious fact that households that have mixed populations, whether of ages or immigrant backgrounds, seem to spend less (in terms of expenditure share, not level) on telecommunications than households that are entirely immigrant or composed of only younger individuals.

In summary, we find that telecommunications behaves very much like other necessities, such as food. We also find evidence that a higher expenditure share on telecommunications is associated with some demographic categories that are also associated with higher disadvantage such as youth, Aboriginal and Torres Strait Islanders, households where no one is employed in

⁹ Financial stress is defined as equal to one if respondent reports any of the following because of a lack of money: inability to pay utility bills or mortgage on time; had to pawn or sell something; went without meals; was unable to heat the home; asked for financial help from family or friends; or asked for help from community/welfare organisation.

the labour market, households with disability/long-term health conditions, migrants from non-English speaking backgrounds and rural households.

Next, we estimate a simple model of expenditure share on telecommunications controlling for the characteristics that we have considered above. Some of the associations found above may be driven by income, so it is important to control for income to put these associations in context. The results are not intended for causal interpretation, but rather to investigate whether the associations identified above are robust when other relevant characteristics such as income and household size are controlled for. We then proceed to a consideration of some simple ways of categorizing low-income households with relatively high or relatively low shares of disposable income spent on telecommunications.

4. Regression results

Table 4 presents a regression of the natural log of expenditure share on telecommunications against the natural log of income and a variety of household characteristics. The first column includes only income, household size, wave dummies and dummies for whether or not telecommunications expenditure and income are imputed. Higher income households have lower expenditure shares, consistent with Figures 2 and 3. Larger households spend more on telecommunications but the coefficient of 0.21 indicates significant economies of scale. Both of the imputation dummies are significant, highlighting the importance of including such dummies and showing that there is some systematic information contained in the imputation.

The second and third columns of Table 4 include controls for household demographics. In the second column labelled “some”, the variables in the shaded rows take value 1 if the characteristics in that row applies to any member of the household. In column three, labelled

“all”, the variables in the shaded rows take value 1 if the characteristic applies to all members of the household. For all variables, the distinction ends up not mattering in practice.

We get similar results if we estimate a model in first differences that controls for unobserved heterogeneity of households. For example, in the model of column one of Table 4 we find a negative and statistically significant coefficient on income of -0.90 and a positive coefficient on household size of 0.30. These are quite similar to the coefficients that we present from the model in levels. We prefer the model in levels because it allows us to control for the (mostly) time-invariant characteristics which are included in columns two and three of Table 4.

The characteristics associated with different expenditure shares which were highlighted in the previous section remain statistically significant when controlling for income and household size. However, many of them change sign, highlighting the confounding effect of income in understanding the relationship between characteristics and telecommunications expenditure shares.

Once we control for income and household size, the following characteristics are actually associated with lower expenditure shares on telecommunications:

- At least one member of the household is Aboriginal or Torres Strait Islander;
- Some or all members of the household are immigrants from non-English speaking countries;
- At least one member of the household speaks English poorly;
- At least one member of the household is unemployed or not in the labour force;
- At least one member of the household has a long-term health condition;
- At least one member of the household is aged 65 or older.

Previously these variables looked to be associated with a higher expenditure shares but most of them are also highly, negatively correlated with income. Once we control for income, these characteristics are associated with lower than expected expenditure on telecommunications (conditional on income and household size), suggesting a lower propensity for telecommunications use.

Some or all of the members of the household having emigrated from English-speaking countries is associated with a higher than expected expenditure share on telecommunications. Being in a household where some or all individuals are younger than 30 is associated with a higher expenditure share on telecommunications. This probably has to do with a preference for telecommunications for this group.

Reports of financial stress are also associated with higher expenditure on telecommunications than one would expect conditional on income. Over-spending on telecommunications could be one source of financial stress which would explain the significant association between these two variables.

Living in a rural or remote region is associated with a higher expenditure share on telecommunications, conditional on income. This would seem to match the evidence, discussed above, that households in remote and rural areas pay more to access telecommunications services. This group may spend more for a number of reasons, including more usage requirements or use of multiple services. While Australian telecommunications companies offer nationally consistent pricing, products on offer may vary by location because of differences in the availability of services, such as mobile coverage or availability of

fixed-line, fixed wireless or satellite internet through the NBN. Importantly, this data predates the rollout of the NBN in many rural and remote regions.

5. Low-income households with relatively high or relatively low telecommunications expenditure

The regression results point to two potential areas of concern. The first is households who might spend a large amount on telecommunications relative to their income. (Financially stressed households and households where all or some members are 30 years of age or less.) These households may have unsustainable or unaffordable telecommunications expenditure.

The second is households who may be missing out on benefits associated with using telecommunications services: having both low income and not spending enough on telecommunications to stay connected and to keep up with the rest of Australia. We now turn to these two issues and propose some simple measures.¹⁰

5.1 ‘Low-income, high spending’ households

We propose a definition of low-income households with high relative shares of disposable income spent on telecommunications services. We define a ‘low-income, high spending’ household if the share of disposable income spent on telecommunications is more than three times the median expenditure share and household income is less than half of median household income. As mentioned above, this may pick up some households who just have a preference for spending a high proportion of their income on telecommunications. However, combined with low incomes, this spending might displace resources for other basic households

¹⁰ We propose measures comparable to measures in the housing affordability literature. See, for example, ABS (2013) or Tanton and Phillips (2013).

needs. The measure is thus one of possible unaffordability rather than ‘irrational’ behaviour. To the extent that households are spending on telecommunications as a necessity to participate in societal interaction and access government assistance, this measure could assist with monitoring households with large shares of expenditure on telecommunications services that may have little disposable income left over for other purposes.

Using this definition we identify between five and seven per cent of households as ‘low-income, high spending’ depending upon wave (see Table 5). Figure 5 plots the level of households over time. Interestingly, this measure spikes during the Global Financial Crisis (GFC) in 2009 and it was somewhat lower before the GFC and somewhat higher post-GFC. Figures 2 and 3, which show declining expenditure shares on average over time, would suggest that telecommunications is becoming more affordable overall. The ‘low-income, high spending’ measure is interesting because it points slightly in the opposite direction. While average affordability may be rising, there is also a group who are possibly spending too much and this group has not shrunk over time.

Table 6 compares the proportion of ‘low-income, high spending’ households across a number of categories. The table is constructed by pooling all ten waves of data. The ‘true’ and ‘false’ columns indicate the proportion of ‘low-income, high spending’ households for which the statement in the first column is either true or false.

The proportion is higher for many groups typically associated with disadvantage, with the largest proportions occurring for households where:

- Every member of the household is unemployed or not in the labour force;
- Every member of the household speaks English poorly;

- Every member of the household is Aboriginal or Torres Strait Islander;
- Every member of the household has a long-term health condition;
- Every member of the household is under financial stress;
- Every member of the household is aged 65 or older.

The fact that many disadvantaged groups are associated with a larger proportion of ‘low-income, high spending’ households suggests there is a close relationship between this measure and disadvantage.

This high spending measure is strongly predictive of future financial stress. Across all waves, if a household is defined by this measure at time t , the probability that it reports financial difficulty at time $t+1$ is 17.7 per cent. If it is not defined by the measure, this probability is only 10.7 per cent. The effect remains statistically significant if included in a standard regression of the determinants of financial stress (such as in Breunig and McKibbin (2011)).

5.2 ‘Low-income, low spending’ households

We propose a definition of low-income households with low relative shares of disposable income spent on communications. The measure is equal to one if a household has less than half of median expenditure on telecommunications and is at or below half of median income. Again, this relatively low expenditure could be driven by preferences—they simply don’t enjoy telecommunications services and thus don’t purchase them. Yet, this group could potentially miss out on a variety of benefits that come from telecommunications connectedness. If these low-income households are spending so little on telecommunications that they cannot access government services, for example, then this measure could assist with the monitoring of households that could be missing out on benefits associated with participating in the telecommunications market.

We identify only a small fraction of ‘low-income, low spending’ households (less than one per cent per year). Figure 5 graphs the distribution over time. None of the year-on-year changes are statistically significant. The fluctuations visible in Figure 5 are indistinguishable from noise.

Table 7 is similar to Table 6, but instead it compares the proportion of ‘low-income, low spending’ households across different categories. The proportions are highest for households where:

- Every member of the household speaks English poorly;
- Every member of the household is aged 65 or older;
- Every member of the household is unemployed or not in the labour force;
- Every member of the household has a long-term health condition;
- At least one member of the household is aged 65 or older.

Once again, many of these groups are often associated with disadvantage.

The proportion is lower for some other groups, including those households with:

- At least one household member aged under 15;
- At least one household member aged from 15 to 30;
- At least one household member aged from 31 to 64;
- Every household member aged from 31 to 64.
- At least one household member who is an immigrant;

Interestingly, households with members aged 64 or below appear to be less likely to have low income and low relative telecommunications expenditure shares than households with members aged 65 or older.

While the share of ‘low-income, low spending’ households is small, many of these households receive welfare. 50.7 per cent of the households that we identify with this measure contain at least one person receiving the age pension. 17 per cent contain at least one person receiving the disability pension. 3.5 per cent contain at least one person receiving the carer payment. 2.3 per cent contain at least one person receiving parenting payment single (a payment for lone parents with young children).

Interestingly, having both low income and low telecommunications expenditure is completely unrelated to receipt of Newstart allowance. Newstart is the main form of unemployment benefits paid in Australia.

There is no overlap between households defined by the two proposed measures. While both measures include low income households, the households included in each measure have the opposite expenditure patterns (high versus low). The limitation of the two proposed measures to only identify a potential for unaffordable expenditure or a lack of participation in the digital economy largely reflects data availability in the communications sector. More detailed data with information on the quality, quantity and nature of telecommunications services consumed and the preferences of consumers would allow for more precise measures.

6. Discussion and conclusion

In this paper we have documented some simple facts about the telecommunications expenditure of households in Australia. It clearly behaves like other necessities such as food and overall, appears to be becoming more affordable even as bandwidth, speed and download limits increase.

We identify some groups who appear to spend very little on telecommunications relative to their income: Aboriginal and Torres Strait Islanders, the unemployed and those not in the labour force, immigrants from non-English speaking backgrounds, people with a long-term health condition, and those age 65 or older. Households who report financial stress, who live in remote or rural areas or who are younger in age distribution tend to spend more on telecommunications, conditional on income, than other households.

We define a measure of low-income households with high relative shares of disposable income spent on telecommunications. Households identified by this measure are more likely (18 per cent compared to 11 per cent) to report financial difficulty in the subsequent period compared to those households without unaffordable expenditure.

We also define a measure of low-income households with low relative shares of disposable income spent on communications. Overall, we find that the number of households identified by this measure is very low in Australia. However, it rises for certain subgroups, particularly those in receipt of the age pension or a disability pension. On the other hand, unemployed individuals in receipt of Newstart show identical rates of both low income and low relative telecommunications expenditure to the overall population. Interestingly, households with members aged less than 65 show lower rates of both low income and low relative telecommunications expenditure to those with members aged 65 or older.

The two measures we have proposed assist with understanding telecommunications expenditure in Australia. The two measures only indicate a potential for unaffordable expenditure or a lack of participation in the digital economy because preferences may be

driving the observed household behaviour. This limitation largely reflects data availability in the communications sector. More comprehensive data would allow for more precise measures. Ideal data would detail the nature of services consumed and their quality and quantity, as well as consumer preferences. This would allow for analysis of whether these groups are consuming communications services that meet their basic needs.

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Table 1

	Households	Telecommunications Expenditure Share		Food Expenditure Share		Household Income	
		Mean (standard deviation)	Median	Mean (standard deviation)	Median	Mean (standard deviation)	Median
Wave 6 (2006)	6,843	0.039 (0.063)	0.024	0.18 (0.12)	0.14	61,819 (46,494)	52,922
Wave 7 (2007)	6,787	0.041 (0.068)	0.024	0.17 (0.13)	0.14	68,101 (67,245)	57,639
Wave 8 (2008)	6,775	0.041 (0.068)	0.024	0.18 (0.13)	0.14	70,667 (55,512)	60,980
Wave 9 (2009)	6,935	0.040 (0.070)	0.022	0.16 (0.13)	0.13	75,811 (56,326)	66,986
Wave 10 (2010)	7,024	0.038 (0.062)	0.023	0.16 (0.12)	0.13	77,606 (59,343)	66,216
Wave 11 (2011)	9,224	0.037 (0.064)	0.022	0.16 (0.12)	0.13	80,012 (60,216)	67,478
Wave 12 (2012)	9,230	0.036 (0.065)	0.021	0.15 (0.11)	0.12	83,345 (61,197)	72,547
Wave 13 (2013)	9,208	0.032 (0.053)	0.020	0.15 (0.12)	0.12	85,330 (66,067)	73,360
Wave 14 (2014)	9,240	0.035 (0.061)	0.021	0.15 (0.11)	0.12	87,602 (70,225)	74,775
Wave 15 (2015)	9,305	0.035 (0.063)	0.020	0.15 (0.11)	0.12	88,541 (66,873)	75,694

Source: HILDA data

Using cross-sectional weights for each wave

Table 2

Descriptive statistics from Wave 15

Household size	2.61 (0.0036)
Telecommunications expenditure (=1 if imputed)	0.17 (0.0058)
Household disposable income (=1 if imputed)	0.25 (0.0068)
At least one member of household is an Aboriginal or Torres Strait Islander	0.033 (0.0027)
At least one member of household is an immigrant	0.37 (0.0010)
At least one member of household is not employed	0.52 (0.0051)
At least one member of household is under financial stress	0.15 (0.0057)
At least one member of household speaks English poorly	0.039 (0.0051)
At least one member of household has a long-term health condition	0.42 (0.0067)
At least one member of household is an immigrant with a non-English speaking background	0.22 (0.0091)
At least one member of household is aged under 15	0.28 (0.0011)
At least one member of household is aged from 15 to 30	0.37 (0.0050)
At least one member of household is aged from 31 to 64	0.70 (0.0047)
At least one member of household is aged 65 or older	0.25 (0.0026)
Every member of household is an Aboriginal or Torres Strait Islander	0.014 (0.0014)
Every member of household is an immigrant	0.22 (0.011)
Every member of household is not employed	0.27 (0.0042)
Every member of household is under financial stress	0.062 (0.0036)
Every member of household speaks English poorly	0.0090 (0.0024)
Every member of household has a long-term health condition	0.20 (0.0051)
Every member of household is an immigrant with a non-English speaking background	0.13 (0.0093)
Every member of household is aged from 15 to 30	0.12 (0.0039)
Every member of household is aged from 31 to 64	0.40 (0.0045)
Every member of household is aged 65 or older	0.18 (0.0035)
Household is located in a rural area	0.10 (0.0061)
Household is located in a remote area	0.012 (0.0028)

N=9,305

Cross-sectional weights used in calculations

Table 3: Expenditure shares on telecommunications by demographic and socio-economic categories

	True	False	Difference
At least one member of household is an Aboriginal or Torres Strait Islander	0.041 (0.0023)	0.037 (0.00048)	0.0042* (0.0024)
At least one member of household is an immigrant	0.036 (0.00073)	0.038 (0.00049)	-0.0026*** (0.00073)
At least one member of household is not employed	0.042 (0.00056)	0.033 (0.00054)	0.0087*** (0.00058)
At least one member of household is under financial stress	0.046 (0.00076)	0.036 (0.00048)	0.010*** (0.00073)
At least one member of household speaks English poorly	0.038 (0.0019)	0.037 (0.00045)	0.0011 (0.0018)
At least one member of household has a long-term health condition	0.040 (0.00057)	0.035 (0.00054)	0.0046*** (0.00061)
At least one member of household is an immigrant with a non-English speaking background	0.037 (0.0010)	0.037 (0.00046)	-0.0005 (0.0010)
At least one member of household is aged under 15	0.032 (0.00063)	0.040 (0.00053)	-0.0082*** (0.00067)
At least one member of household is aged from 15 to 30	0.037 (0.00068)	0.038 (0.00054)	-0.0010*** (0.00075)
At least one member of household is aged from 31 to 64	0.033 (0.00044)	0.048 (0.00096)	-0.016*** (0.00096)
At least one member of household is aged 65 or older	0.043 (0.00084)	0.036 (0.00049)	0.0071*** (0.00086)
Every member of household is an Aboriginal or Torres Strait Islander	0.056 (0.0043)	0.037 (0.00047)	0.019*** (0.0043)
Every member of household is an immigrant	0.041 (0.0011)	0.036 (0.00044)	0.0046*** (0.0010)
Every member of household is not employed	0.052 (0.00088)	0.032 (0.00047)	0.020*** (0.00091)
Every member of household is under financial stress	0.059 (0.0016)	0.036 (0.00045)	0.023*** (0.0015)
Every member of household speaks English poorly	0.051 (0.0054)	0.037 (0.00046)	0.013** (0.0054)
Every member of household has a long-term health condition	0.050 (0.00093)	0.034 (0.00046)	0.016*** (0.00093)
Every member of household is an immigrant with a non-English speaking background	0.042 (0.0015)	0.037 (0.00043)	0.0054*** (0.0014)
Every member of household is aged from 15 to 30	0.050 (0.0015)	0.035 (0.00043)	0.015*** (0.0014)
Every member of household is aged from 31 to 64	0.034 (0.00056)	0.039 (0.00060)	-0.0049*** (0.00071)
Every member of household is aged 65 or older	0.048 (0.0010)	0.035 (0.00047)	0.012*** (0.0010)
Household is located in a rural area	0.042 (0.0011)	0.037 (0.00051)	0.0051*** (0.0012)
Household is located in a remote area	0.037 (0.0024)	0.037 (0.00047)	-0.00019 (0.0023)

* Difference significant at 10% level

** Difference significant at 5 % level

*** Difference significant at 1% level

Table 4: Regression results

Dependent variable: ln(telecommunications expenditure share)		Some	All
ln(household income)	-0.77*** (0.0043)	-0.82*** (0.0049)	-0.83*** (0.0050)
ln(household size)	0.21*** (0.0058)	0.18*** (0.0092)	0.17*** (0.0088)
Wave 6 is omitted category			
Wave 7	0.061*** (0.013)	0.066*** (0.013)	0.066*** (0.013)
Wave 8	0.11*** (0.013)	0.11*** (0.013)	0.11*** (0.013)
Wave 9	0.081*** (0.013)	0.091*** (0.013)	0.093*** (0.013)
Wave 10	0.11*** (0.013)	0.12*** (0.013)	0.13*** (0.013)
Wave 11	0.087*** (0.012)	0.10*** (0.012)	0.10*** (0.012)
Wave 12	0.085*** (0.012)	0.10*** (0.012)	0.11*** (0.012)
Wave 13	0.036*** (0.012)	0.057*** (0.012)	0.060*** (0.012)
Wave 14	0.077*** (0.012)	0.099*** (0.012)	0.10*** (0.012)
Wave 15	0.070*** (0.012)	0.094*** (0.012)	0.096*** (0.012)
=1 if expenditure is imputed	0.013* (0.073)	-0.00046 (0.0074)	-0.00051 (0.0074)
=1 if household income is imputed	0.023*** (0.065)	0.031*** (0.0065)	0.038*** (0.0065)
Aboriginal or Torres Strait Islander		-0.094*** (0.014)	-0.093*** (0.022)
Immigrant		0.026*** (0.0079)	0.023** (0.011)
Speaks English poorly		-0.13*** (0.020)	-0.092** (0.039)
Long-term health condition		-0.013** (0.0059)	-0.019** (0.0076)
Immigrant from a non-English speaking country		-0.024** (0.010)	-0.046*** (0.014)
Not employed		-0.083*** (0.0066)	-0.17*** (0.0085)
Financial stress		0.11*** (0.0076)	0.13*** (0.011)
Individuals aged 65 or older		-0.096*** (0.010)	-0.16*** (0.011)
Individuals aged from 31 to 64, inclusive		0.049*** (0.0084)	-0.060*** (0.0077)
Individuals aged from 15 to 30, inclusive		0.12*** (0.0077)	0.020** (0.0094)
Household has at least one member under the age of 15		0.0014 (0.0090)	0.010 (0.0089)
Household is located in a rural area		0.068*** (0.0082)	0.061*** (0.0082)
Household is located in a remote area		0.037* (0.020)	0.035* (0.020)
Public housing		-0.29 (0.20)	-0.28 (0.20)
Constant	4.45*** (0.045)	4.95*** (0.052)	5.22*** (0.053)
Sample size	80,571	80,566	80,566
Pseudo R-squared	31.2%	33.2%	32.6%

***Significant at 1 per cent level

**Significant at 5 per cent level

*Significant at 10 per cent level

Expenditure share is defined as household annual expenditure on telephone and internet charges divided by annual household disposable income. For shaded variables, 'some' column indicates that at least one person in the household matches this characteristic. 'All' column indicates that all people in the household share this characteristic.

Pseudo R-squared is the correlation between the level of expenditure share and the predicted level of expenditure share from the model estimated on logarithms

Table 5: Low-income households with relatively high or relatively low expenditure on telecommunications, by wave

	Households	'Low-income, high spending' households	'Low-income, low spending' households
		Mean (standard deviation)	Mean (standard deviation)
Wave 6 (2006)	6,843	0.052 (0.22)	0.0098 (0.098)
Wave 7 (2007)	6,787	0.063 (0.24)	0.0081 (0.090)
Wave 8 (2008)	6,775	0.064 (0.25)	0.0071 (0.084)
Wave 9 (2009)	6,935	0.071 (0.26)	0.0062 (0.079)
Wave 10 (2010)	7,024	0.062 (0.24)	0.0090 (0.094)
Wave 11 (2011)	9,224	0.061 (0.24)	0.0078 (0.088)
Wave 12 (2012)	9,230	0.062 (0.24)	0.0078 (0.088)
Wave 13 (2013)	9,208	0.064 (0.24)	0.0094 (0.097)
Wave 14 (2014)	9,240	0.066 (0.25)	0.0083 (0.091)
Wave 15 (2015)	9,305	0.064 (0.24)	0.0083 (0.091)

Source: HILDA data

Using cross-sectional weights for each wave

Table 6: ‘Low-income, high spending’ households, by demographic and socio-economic categories, pooled across waves

	Yes	No	Difference
At least one member of household is an Aboriginal or Torres Strait Islander	0.087 (0.0053)	0.062 (0.00087)	0.025*** (0.0046)
At least one member of household is an immigrant	0.056 (0.0015)	0.066 (0.0010)	-0.0092*** (0.0019)
At least one member of household is not employed	0.091 (0.0014)	0.036 (0.00092)	0.055*** (0.0017)
At least one member of household is under financial stress	0.073 (0.0023)	0.061 (0.00092)	0.012*** (0.0024)
At least one member of household speaks English poorly	0.072 (0.0065)	0.063 (0.00086)	0.0093 (0.0062)
At least one member of household has a long-term health condition	0.081 (0.0015)	0.051 (0.0010)	0.030*** (0.0017)
At least one member of household is an immigrant with a non-English speaking background	0.062 (0.0022)	0.063 (0.00093)	-0.00070 (0.0024)
At least one member of household is aged under 15	0.018 (0.00089)	0.080 (0.0011)	-0.062*** (0.0019)
At least one member of household is aged from 15 to 30	0.053 (0.0013)	0.069 (0.0011)	-0.016*** (0.0018)
At least one member of household is aged from 31 to 64	0.039 (0.00084)	0.11 (0.0019)	-0.069*** (0.0018)
At least one member of household is aged 65 or older	0.10 (0.0022)	0.052 (0.00089)	0.049*** (0.0020)
At least one member of household receives the Telephone Allowance	0.11 (0.0021)	0.045 (0.00085)	0.067*** (0.0019)
Every member of household is an Aboriginal or Torres Strait Islander	0.16 (0.010)	0.061 (0.00085)	0.10*** (0.0033)
Every member of household is an immigrant	0.091 (0.0026)	0.058 (0.00089)	0.033*** (0.012)
Every member of household is not employed	0.15 (0.0023)	0.030 (0.00071)	0.12*** (0.019)
Every member of household is under financial stress	0.13 (0.0044)	0.058 (0.00085)	0.070*** (0.0033)
Every member of household speaks English poorly	0.16 (0.018)	0.063 (0.00085)	0.10*** (0.012)
Every member of household has a long-term health condition	0.14 (0.0027)	0.044 (0.00081)	0.091*** (0.0021)
Every member of household is an immigrant with a non-English speaking background	0.096 (0.0037)	0.060 (0.00087)	0.036*** (0.0032)
Every member of household is aged from 15 to 30	0.098 (0.0026)	0.056 (0.00089)	0.043*** (0.0023)
Every member of household is aged from 31 to 64	0.050 (0.0012)	0.072 (0.0012)	-0.022*** (0.0017)
Every member of household is aged 65 or older	0.12 (0.0027)	0.051 (0.00085)	0.068*** (0.0022)
Household is located in a rural area	0.076 (0.0027)	0.061 (0.00090)	0.014*** (0.0026)
Household is located in a remote area	0.070 (0.0068)	0.063 (0.00086)	0.0067 (0.0066)
Mean household income	16,801	78,313	
Mean expenditure share	0.19	0.030	
Households	5,076	75,495	

* Difference significant at 10% level

** Difference significant at 5% level

*** Difference significant at 1% level

Table 7: ‘Low-income, low spending’ households, by demographic and socio-economic categories, pooled across waves

	Yes	No	Difference
At least one member of household is an Aboriginal or Torres Strait Islander	0.0094 (0.0018)	0.0082 (0.00032)	0.0013 (0.0017)
At least one member of household is an immigrant	0.0069 (0.00054)	0.0087 (0.00039)	-0.0019*** (0.00070)
At least one member of household is not employed	0.013 (0.00058)	0.0032 (0.00028)	0.010*** (0.00063)
At least one member of household is under financial stress	0.0072 (0.00075)	0.0084 (0.00035)	-0.0012 (0.00087)
At least one member of household speaks English poorly	0.017 (0.0033)	0.0080 (0.00032)	0.0091*** (0.0023)
At least one member of household has a long-term health condition	0.012 (0.00061)	0.0055 (0.00034)	0.0067*** (0.00065)
At least one member of household is an immigrant with a non-English speaking background	0.0076 (0.00079)	0.0083 (0.00035)	-0.00073 (0.00089)
At least one member of household is aged under 15	0.0013 (0.00024)	0.011 (0.00043)	-0.0096*** (0.00071)
At least one member of household is aged from 15 to 30	0.0042 (0.00038)	0.011 (0.00045)	-0.0063*** (0.00066)
At least one member of household is aged from 31 to 64	0.0039 (0.00027)	0.016 (0.00076)	-0.012*** (0.00032)
At least one member of household is aged 65 or older	0.020 (0.0010)	0.0048 (0.00028)	0.015*** (0.00075)
At least one member of household receives the Telephone Allowance	0.021 (0.00098)	0.0034 (0.00024)	0.018*** (0.00071)
Every member of household is an Aboriginal or Torres Strait Islander	0.015 (0.0034)	0.0081 (0.00032)	0.0070*** (0.0026)
Every member of household is an immigrant	0.011 (0.00096)	0.0077 (0.00033)	0.0034*** (0.00090)
Every member of household is not employed	0.022 (0.00098)	0.0026 (0.00021)	0.020*** (0.00070)
Every member of household is under financial stress	0.012 (0.0014)	0.0079 (0.00032)	0.0042*** (0.0012)
Every member of household speaks English poorly	0.038 (0.0095)	0.0081 (0.00032)	0.029*** (0.0045)
Every member of household has a long-term health condition	0.020 (0.0011)	0.0052 (0.00028)	0.015*** (0.00078)
Every member of household is an immigrant with a non-English speaking background	0.012 (0.0014)	0.0079 (0.00032)	0.0042*** (0.0012)
Every member of household is aged from 15 to 30	0.0082 (0.00077)	0.0082 (0.00035)	-0.000059 (0.00085)
Every member of household is aged from 31 to 64	0.0053 (0.00040)	0.010 (0.00046)	-0.0050*** (0.00065)
Every member of household is aged 65 or older	0.024 (0.0013)	0.0048 (0.00027)	0.020*** (0.00083)
Household is located in a rural area	0.0095 (0.0010)	0.0080 (0.00034)	0.0015 (0.00097)
Household is located in a remote area	0.011 (0.0029)	0.0081 (0.00032)	0.0033 (0.0024)
Mean household income	23,776	74,856	
Mean expenditure share	0.0079	0.040	
Households	661	79,910	

* Difference significant at 10% level

** Difference significant at 5% level

*** Difference significant at 1% level

Figure 1: Average share of household disposable income spent on telecommunications and food

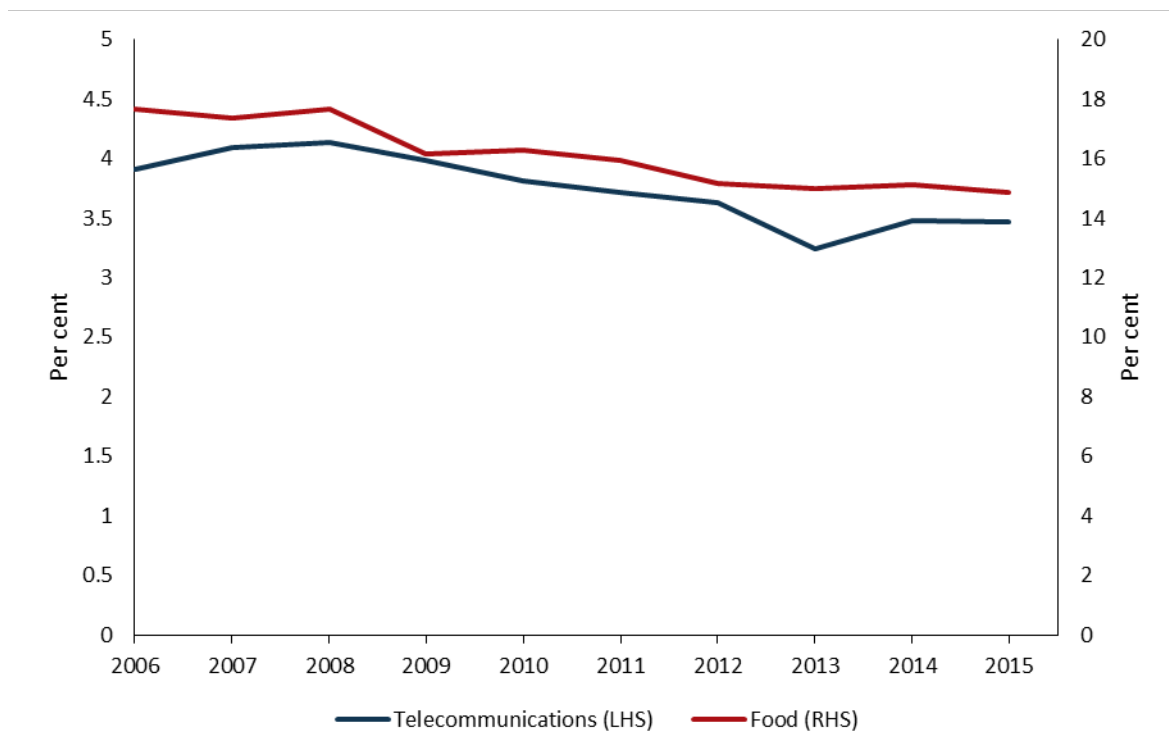


Figure 2: Average share of household disposable income spent on telecommunications and food, by household disposable income decile

Figure 2a: wave 6 (2006)

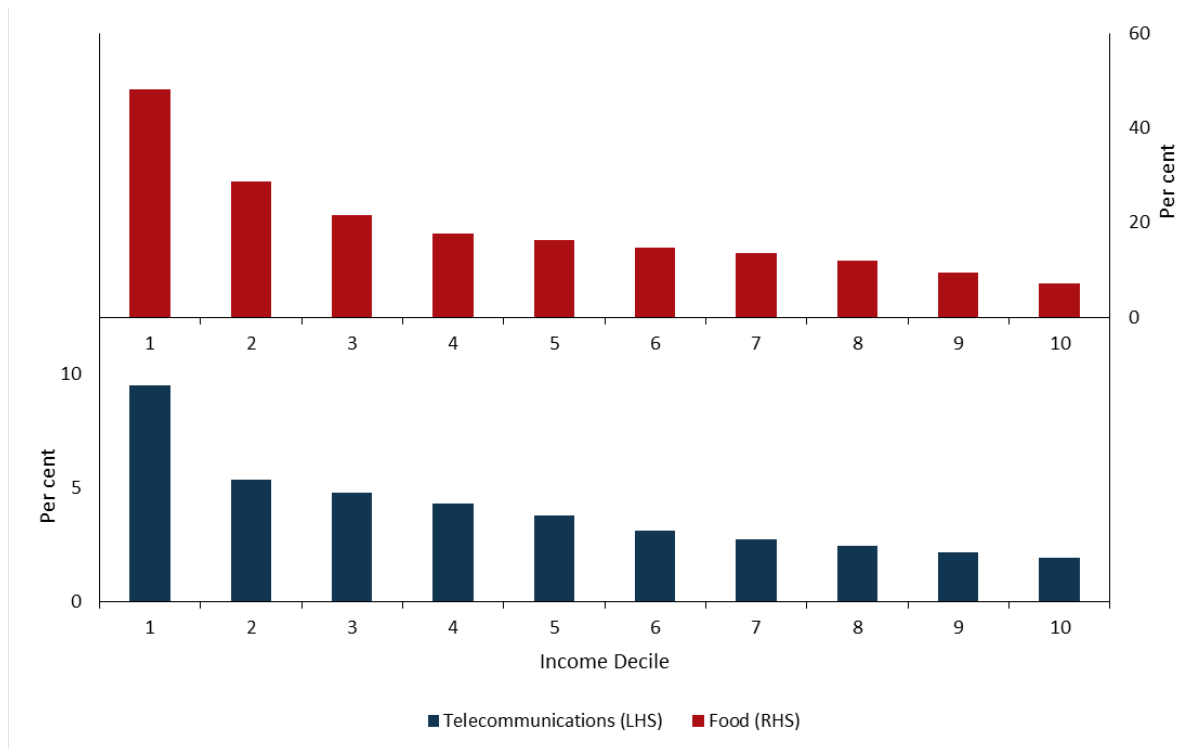
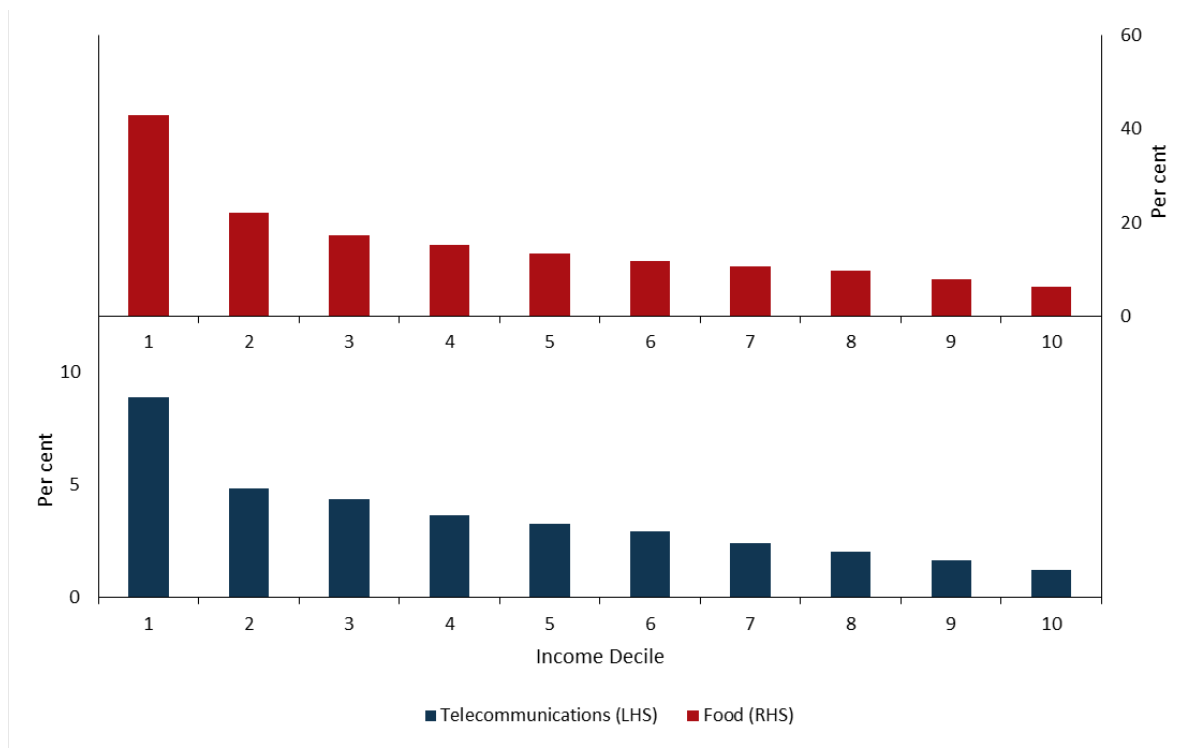


Figure 2b: wave 15 (2015)



Figures 3a – 3b: Average share of household income spent on telecommunications, by household income decile, HES data

Figure 3a: HES 2015-16

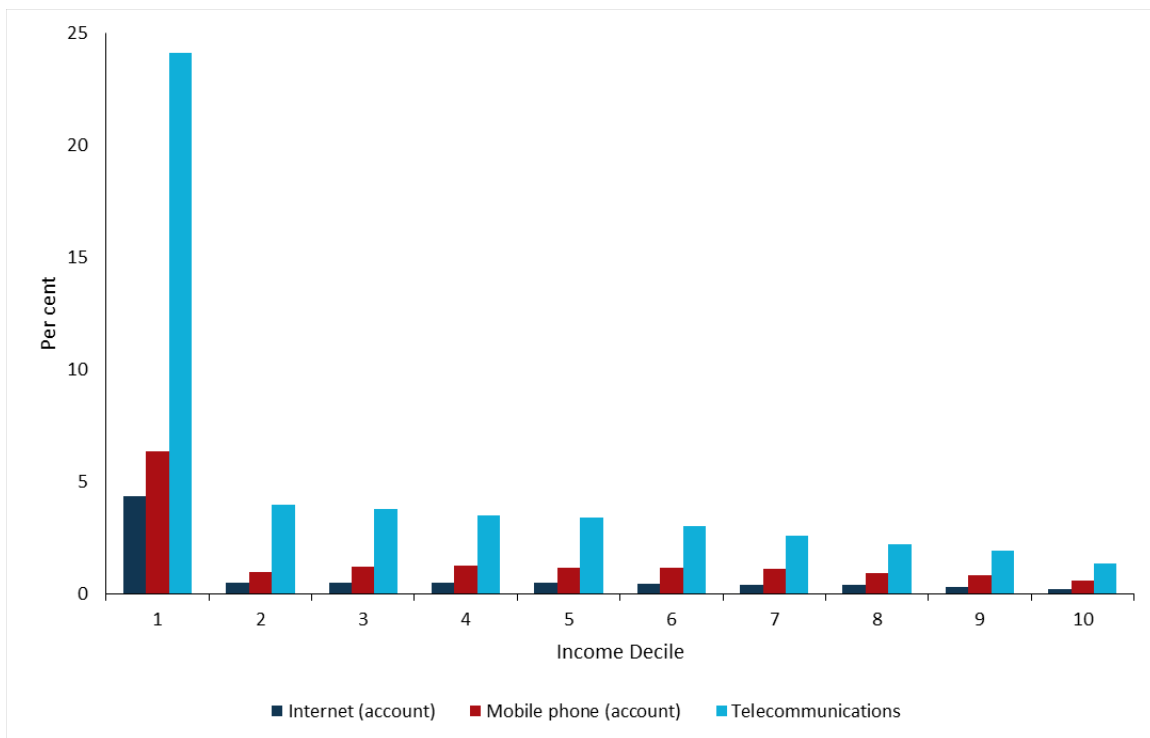


Figure 3b: HES 2009-10

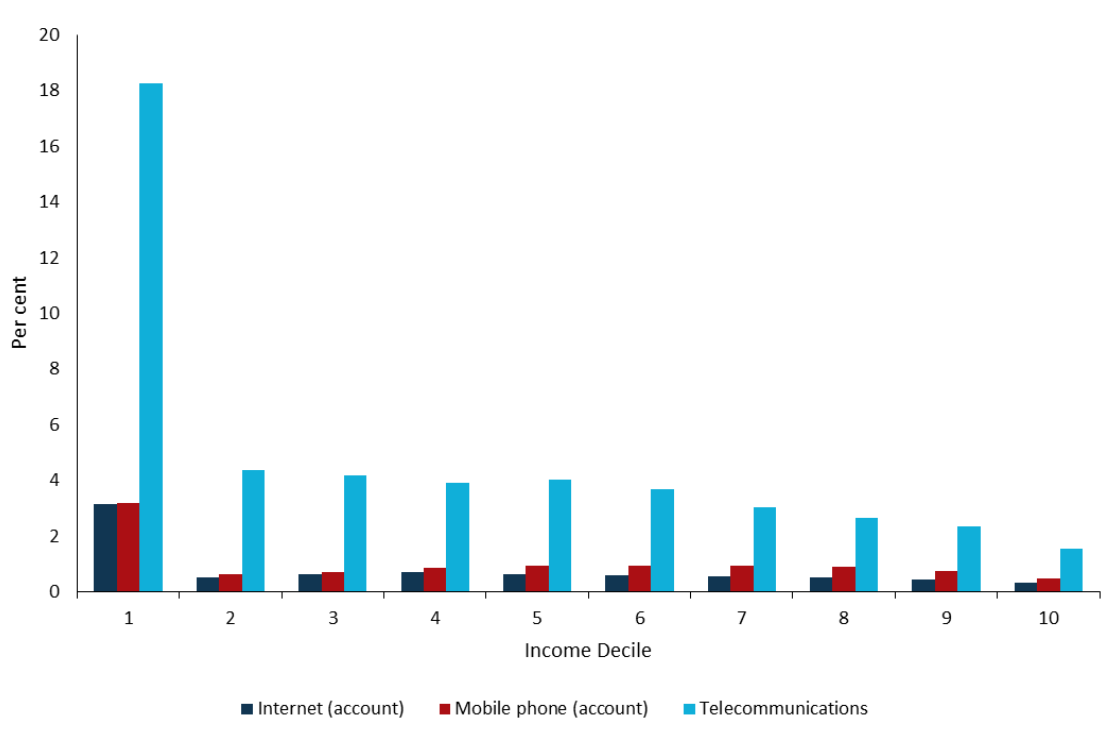


Figure 4: Average share of household disposable income spent on telecommunications and food, by decile of geographical disadvantage, wave 15 (2015)

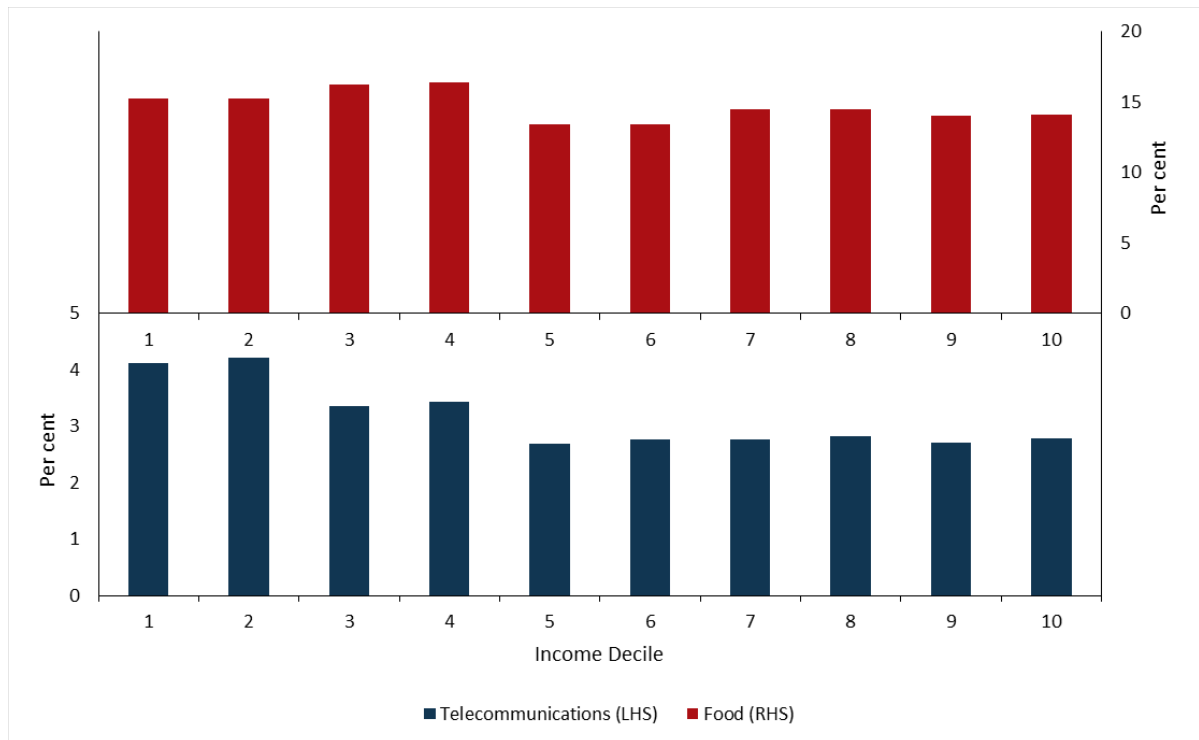
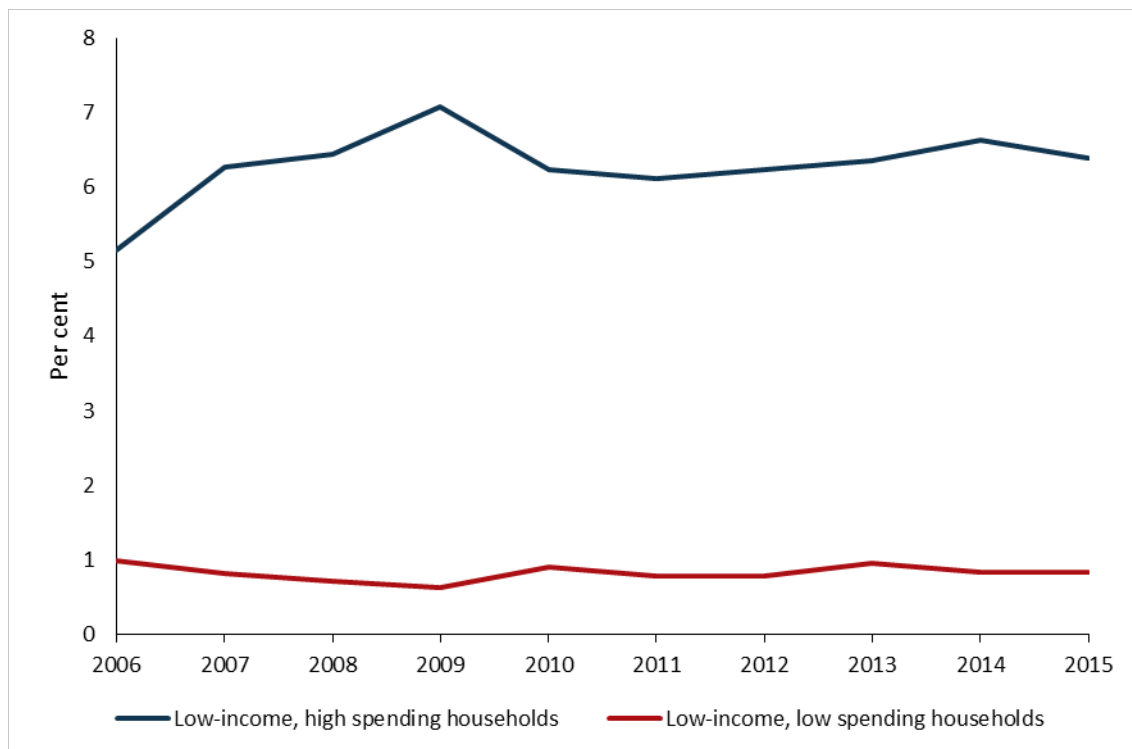
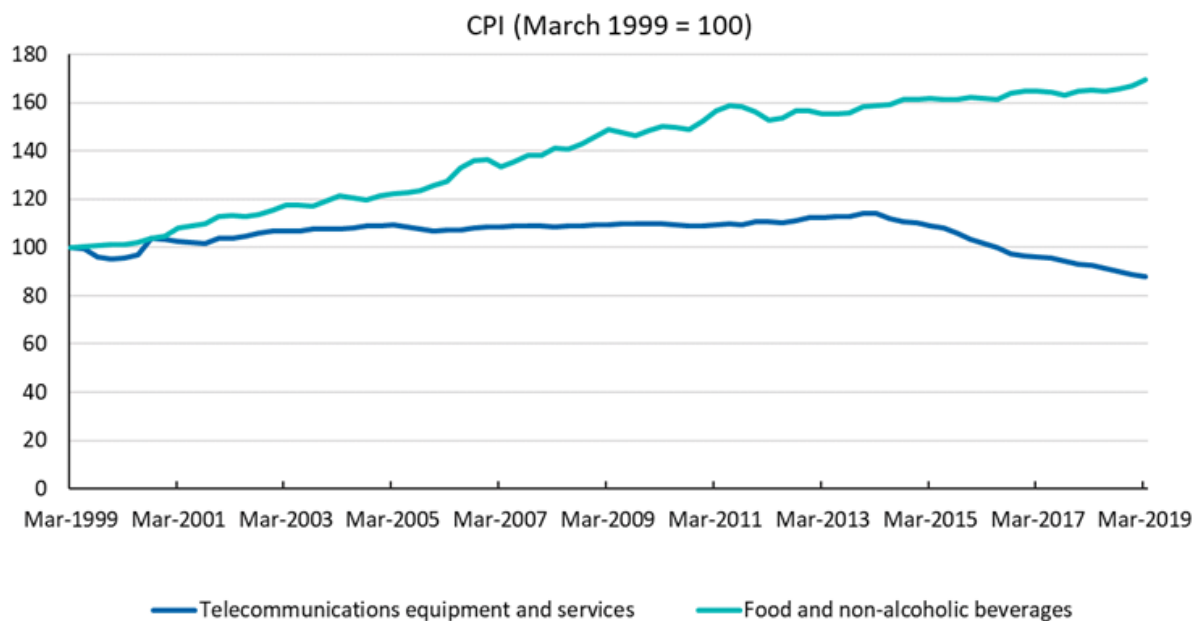


Figure 5: Low-income households with relatively high or relatively low expenditure on telecommunications, by wave



APPENDIX

Figure A.1: Evolution of telecommunication and food prices



Source: ABS cat. 6401.0 - Consumer Price Index, Australia, Mar 2019, TABLE 7. CPI: Group, Sub-group and Expenditure Class, Weighted Average of Eight Capital Cities