Project 2030

Montana's Ageing Population

Prepared By:

- George W. Haynes, Professor
- Myles J. Watts, Professor
- Douglas J. Young, Professor Emeritus

- Heather Smart, Research Assistant
- Grant Zimmerman, Research Assistant

Department of Agricultural Economics and Economics
Montana State University
Bozeman, MT 59717

Contact:

- Myles, J. Watts
  406-994-3701
  mwatts@montana.edu

- George W. Haynes
  406-994-5012
  Haynes@montana.edu

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ACKNOWLEDGMENTS

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INTRODUCTION

Montana will become much older in coming decades as the "Baby Boom" generation reaches retirement age.[1] Changing demographics will affect state and local government budgets in a variety of ways. On the revenue side, income taxes may fall as Baby Boomers retire. On the expenditure side, state and local governments pay for a variety of services for the elderly including some health care and residential living facilities. Expenditures on these programs are likely to increase as the elderly population grows. On the other hand, the portions of the population in the K-12 and higher education age ranges will decline, reducing budget pressures from these sectors. Prudent policy should consider projected demographic changes and their impact on budgetary issues.

This report describes how Montana is expected to age in coming decades and begins the process of analyzing the fiscal impacts by considering expenditure on Medicaid for the elderly, education, and corrections. We also examine the effects of ageing on income and residential property taxes. We find that changes in the age distribution will not by themselves have major impacts on the combined budgets of state and local government – increased expenditure on the elderly will be offset by decreased expenditure on the young. However, ageing will have different impacts in various parts of the state, with the rural counties of Eastern Montana generally ageing more rapidly than Western Montana. In addition, greater fiscal challenges may emerge from trends in health care and other costs and potential decreases in federal funding.

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[1] Statewide demographic projections data for years later than 2010 are from the U.S. Census benchmarked to 2010 Census. NPA 2007 projection data was used for county level projections. For a further discussion of demographic data see Appendix A

DEMOGRAPHICS

In 2010 Montana's total population was 989 thousand. The total population is expected to be 1.04 million in 2020, and 1.07 million in 2030. Figure 1 divides Montana's population into three groups by years of age: 0 to 17, 18 to 64, and 65 plus. Most members of the youngest age group ("youth") are not economically active, because they are at home or in school. The middle group is sometimes referred to as "working age," although some of the youngest and oldest members of this group may still be in school or on early retirement. People in the oldest group ("elderly") are mostly retired. Although these divisions are not perfect, they provide an objective way of describing changes in the age composition of the population.

Figure 1: Montana Population by Age Group
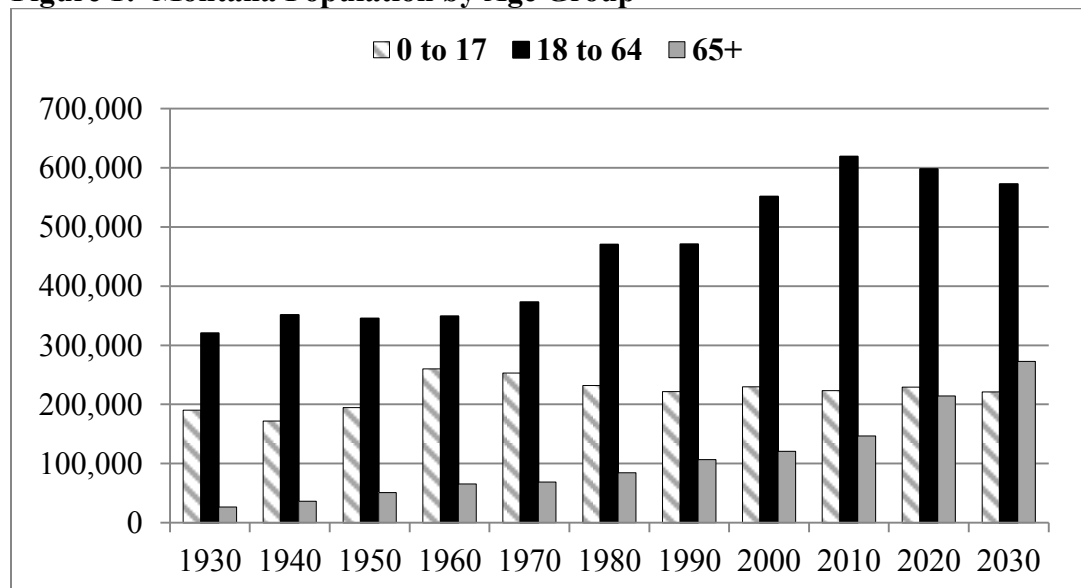
Source: U.S. Census. Years 2020 and 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

The number of elderly has increased in every decade since 1930, and is expected to increase more rapidly in the next two decades. The working age population has risen every decade since 1930, except for a small decline between 1940 and 1950. However, the working

age population is expected to decline in the next two decades. The youth population peaked in 1960 and has declined in 2010 and is expected to be relatively stable in the next two decades.

Figure 2: Montana Age Groups as a Percent of Total Montana Population
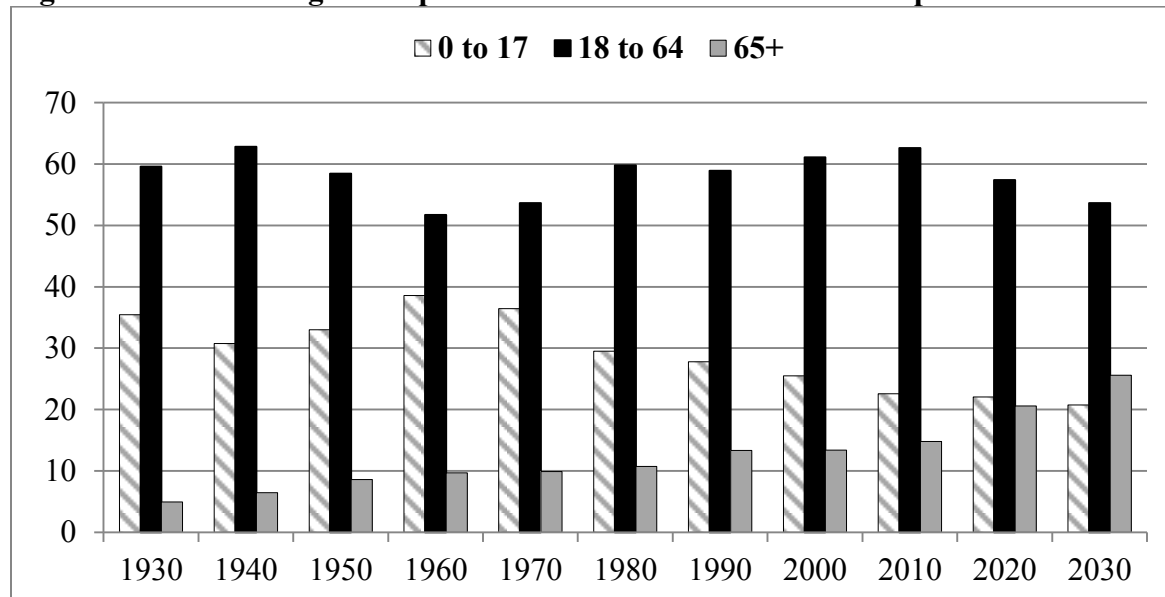
Sources: U.S. Census. Years 2020 and 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Figure 2 presents the same data in terms of percentages of the total population. It tells a simple but compelling story: The percentage of the Montana population that is elderly tripled in the eight decades between 1930 and 2010, and the percentage elderly is projected to almost double again between 2010 and 2030. The elderly share of the population is growing for several reasons. First, people are living longer. Between 1950 and 2007, life expectancy at age 65 increased from 13.9 years to 18.6 years.[2] Second, the Baby Boomers, born between 1946 and 1964, are currently nearing retirement age and will increase the ranks of the elderly in coming decades. Another reason that the elderly are a growing fraction of the population is that birth rates have declined. As fewer children are born, they make up a smaller percentage of the total population. Finally, young adults age 20 to 29 have been migrating out of Montana for some

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[2] National Vital Statistics Reports, Table 22, Feb 2011, and www.cdc.gov/nchs/data/hus/hus10.pdf#027

years. These trends are affecting other states as well, but they are especially significant here. By 2030 Montana is projected to have the fifth highest percentage of population aged 65 plus.[3]

The youth and elderly populations are economically dependent on the working age population. Youth are dependent on their parents for food, clothing, shelter, etc., and public schools and other services for youth are financed by taxes that fall primarily on the working age population. Most retirees depend on Social Security, Medicare and other benefits that are largely financed by taxes on workers.[4] Many elderly also rely on their children for time, money, and care.

The ability of the working age population to support both youth and elderly depends on the number of dependents per working age person. The ratio of youth to the working age population – the youth dependency ratio (YDR), measures the number of youth for each person of working age. The ratio of elderly to the working age population – the elderly dependency ratio (EDR) – measures the number of elderly for each person of working age. The total dependency ratio (TDR) is the sum of the youth and elderly dependency ratios. Youth, elderly, and total dependency ratios are displayed in Figure 3 and Table 1.

The elderly dependency ratio has risen steadily since 1930 and is projected to rise over the next few decades. Currently there are four people of working age for each elderly person; projections suggest that there will be about two people of working age for each elderly person by 2030.

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[3] www.census.gov/population/www/projections/files/PressTab3.xls
[4] See for example, U.S. Social Security Administration, Annual Statistical Supplement, 2011, Table 3.E3. www.ssa.gov/policy/docs/statcomps/supplement/

Figure 3: Montana Age Dependency Ratios
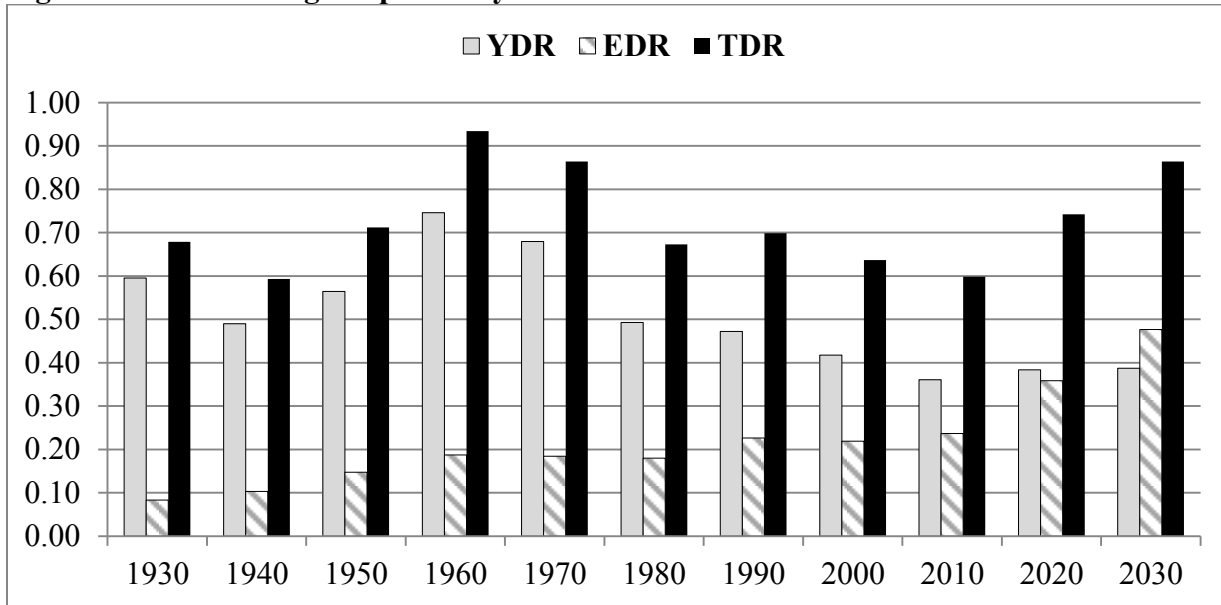
Sources: U.S. Census. Years 2020 and 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Table 1: Montana Age Dependency Ratios

| Year	YDR	EDR	TDR
1930	0.60	0.08	0.68
1940	0.49	0.10	0.59
1950	0.56	0.15	0.71
1960	0.75	0.19	0.94
1970	0.68	0.18	0.86
1980	0.49	0.18	0.67
1990	0.47	0.23	0.70
2000	0.42	0.22	0.64
2010	0.36	0.24	0.60
2020	0.38	0.36	0.74
2030	0.39	0.48	0.87

Sources: U.S. Census. Years 2020 and 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

The youth dependency ratio was high in the 1950s to 1970s when the Baby Boomers were young but has declined to historically low levels in recent years. It is expected to increase only moderately by 2030, when there will be about two and a half working age people for each youth. The total dependency ratio reflects both of these trends. It peaked around 1960 and declined to the 1940 level in 2010, then will rise sharply by 2030. By 2030 there will be about 1.15 persons of working age for each youth or elderly person. However, only about 78 percent

of the working age population will be in the labor force, so there will be less than one worker for each dependent person.[5]

Dependency ratio changes will differ substantially across Montana. Figures 4 and 5 illustrate youth dependency ratios by county in 2010 and 2030, respectively. Lighter colors on these maps indicate lower dependency ratios and darker colors indicate higher dependency ratios. Some counties associated with Native American Reservations (Big Horn, Blaine, Glacier, Roosevelt, and Rosebud) have higher youth dependency ratios, because birth rates are higher. Youth dependency ratios increase in all but seven counties by 2030. They remain high in most of the counties associated with reservations and also increase in most other eastern Montana counties. In general, increases in the youth dependency ratio are mostly driven by the declining working age population.

Growth in the elderly population is more dramatic. Figures 6 and 7 display county-level data on the elderly dependency ratio in 2010 and projected for 2030. Forty-nine of Montana's 56 counties are projected to have elderly dependency ratios of 0.35 or higher and 14 of these counties will exceed 0.55 by 2030. The only exceptions are counties that have large university or American Indian populations.

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[5] U.S. Bureau of Labor Statistics, Tables 3.2 and 3.4. www.bls.gov/emp/home.htm#labtables

Figure 4: 2010 YDR Montana Counties Distribution Map

Source: U.S. 2010 Decennial Census

Youth Dependency Ratio

- 0.00 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40
- 0.41 - 0.45
- 0.46 - 0.85
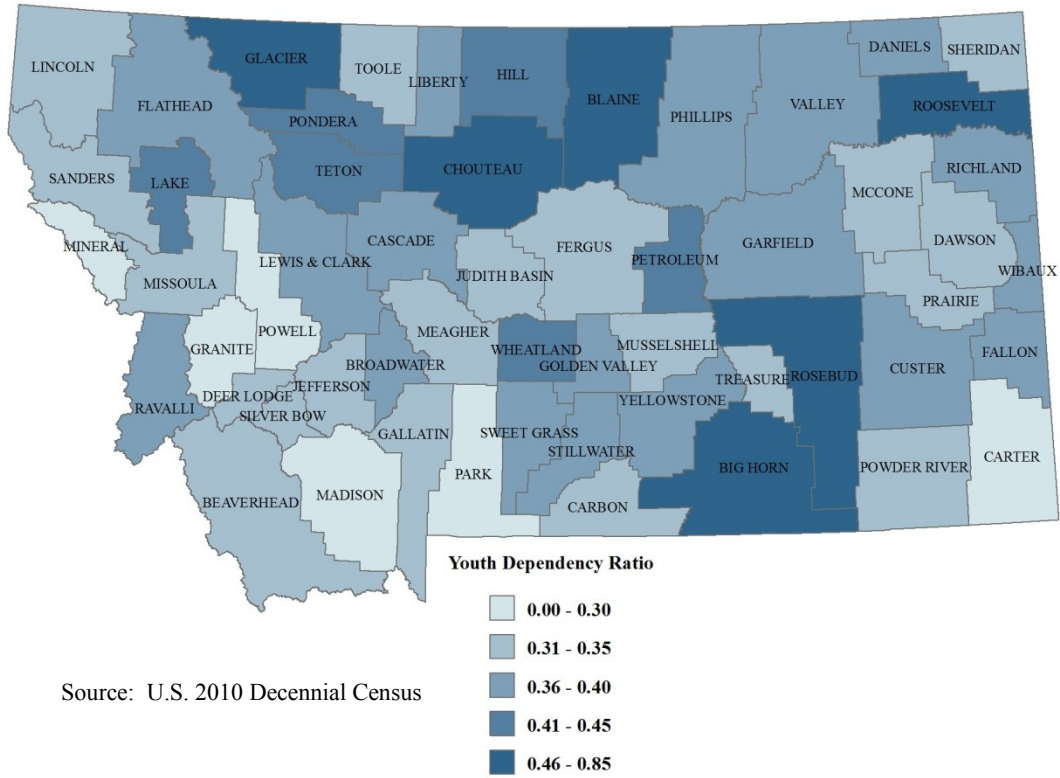
Figure 5: 2030 YDR Montana Counties Distribution Map

Source: NPA, Inc. Population
Projections revised with the 2010
Census

Youth Dependency Ratio

- 0.00 - 0.30
- 0.31 - 0.35
- 0.36 - 0.40
- 0.41 - 0.45
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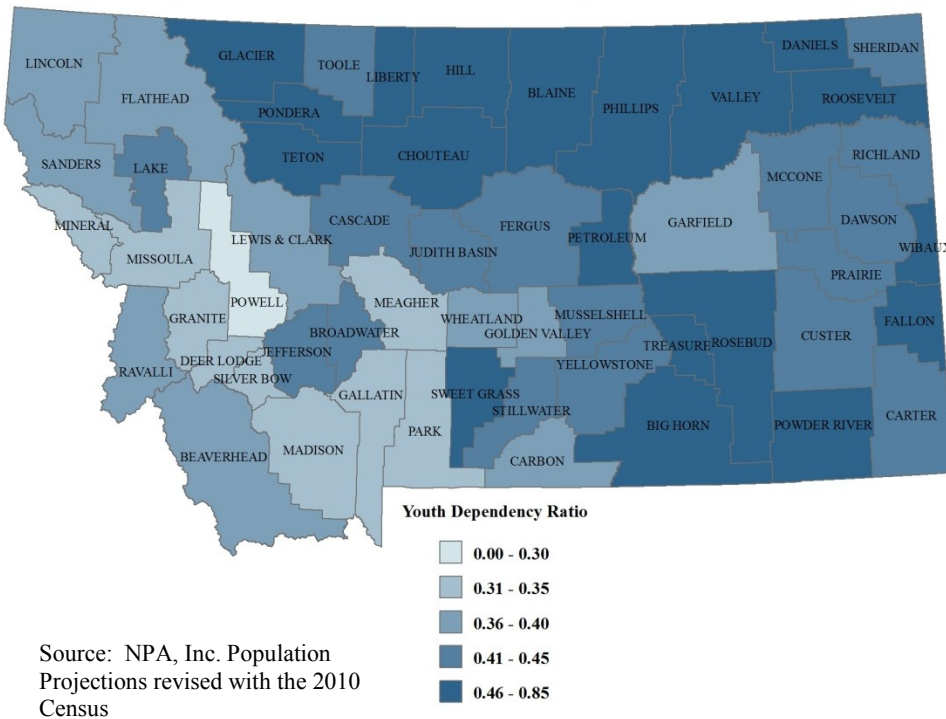
Figure 6: 2010 EDR Montana Counties Distribution Map

Source: U.S. 2010 Decennial Census
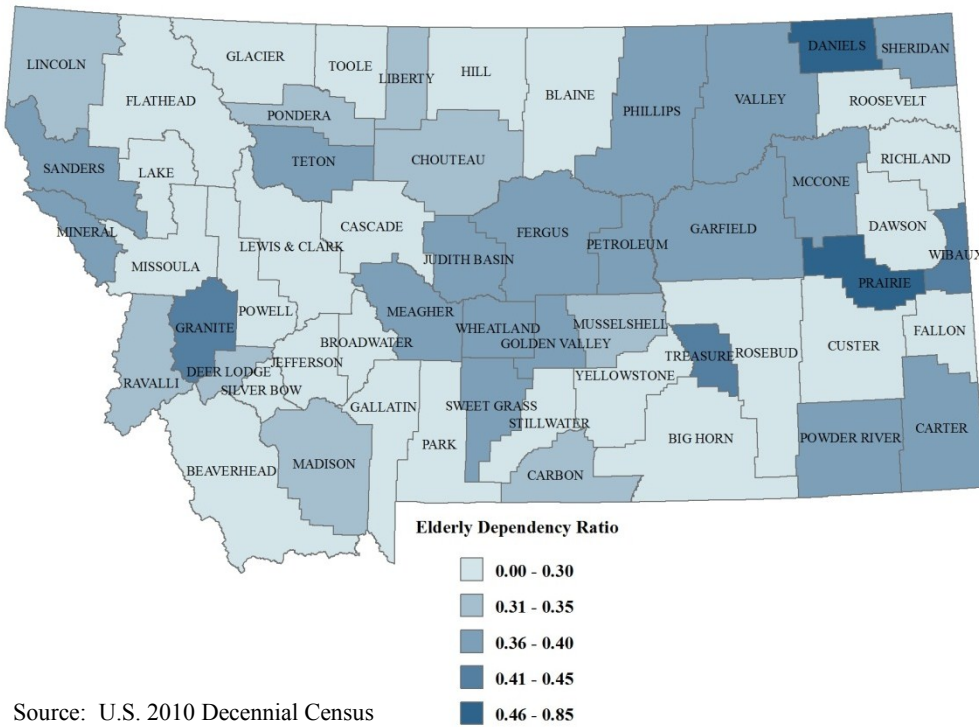
Figure 7: 2030 EDR Montana Counties Distribution Map

Source: NPA, Inc. Population
Projections revised with the 2010
Census
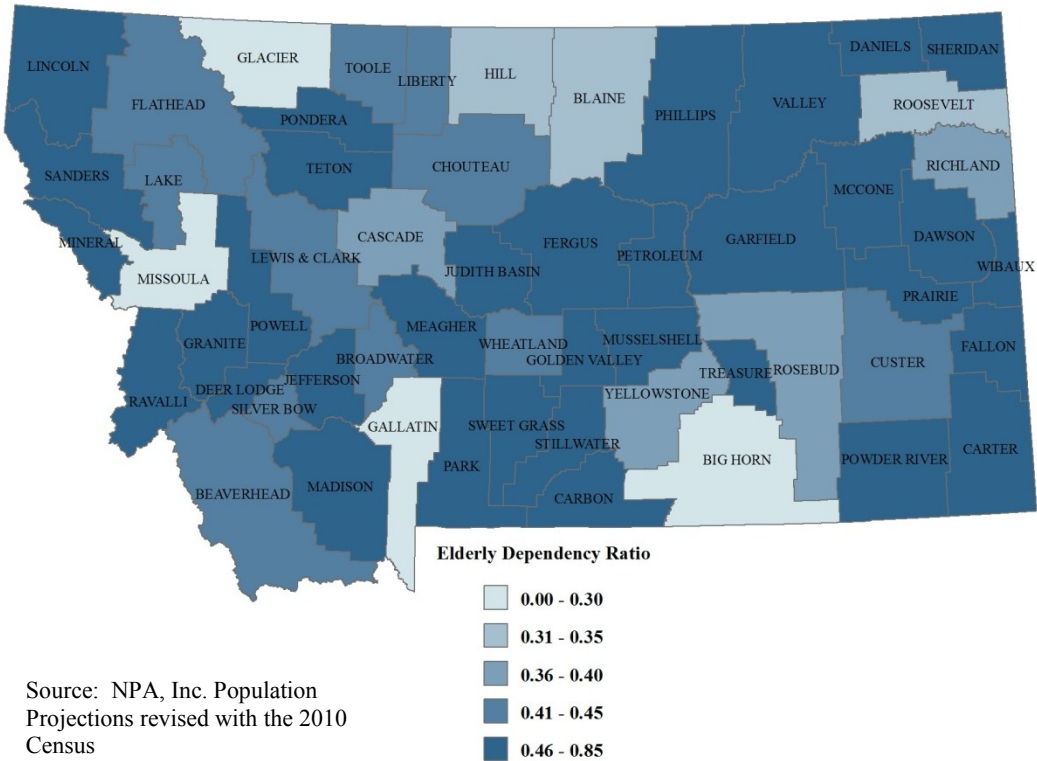
MIGRATION

Migration had dramatic impacts on Montana during the last two decades, affecting total population, its distribution among counties, and composition by age. This report uses population data from the 2000 and 2010 Censuses and death data from the Centers for Disease Control (CDC) to estimate net migration to Montana.[6] Net migration may be positive or negative, i.e. more people may move in than move out, or vice-versa.[7]

Figure 8 displays net migration to Montana during the decade 2000 to 2010.[8] Migrants are classified by their age in 2010. Two features are noticeable; first, overall net migration was positive: 46,000 more people moved into Montana than moved out during the 2000s. Net migration accounted for just over one-half of Montana's total population gain of 87,000 during the decade. The rest of the gain came from natural increase: births minus deaths.

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[6] Total population of age in year t, P(a,t), is equal to total population of age a-1 in year t-1, P(a-1,t-1), minus deaths of age a-1 in year t-1, D(a-1,t-1) + net migration, M(a,t).

P(a,t) = P(a-1,t-1) – D(a-1,t-1) + M(a,t)

Rearranging, net migration in a single year is,

M(a,t) = P(a,t) - P(a-1,t-1) + D(a-1,t-1),

and net migration over a decade is,

$$\sum_{s=0}^{9} M\left(a-s, t-s\right) = P\left(a,t\right) - P\left(a-10,\, t-10\right) + \sum_{s=1}^{10} D\left(a-s,\, t-s\right)$$

[7] The estimates are not perfect for several reasons. First population estimates are as of April 1 of the decennial census years, while the death data are on a calendar year basis. Thus, it is not clear whether someone who died at age 25 in year 2000 died before or after the census was taken. Second, it is possible that people may migrate just before death, e.g. if people were to enter intensive care in Billings shortly before dying. In practice, the adjustments for deaths are not very important except at the oldest ages, and we limit our estimates to those age 75 or less in 2010. Third, net migration for people under the age of 10 in 2010 cannot be estimated by this method, because they were not alive in 2000.

[8] Migration patterns were very similar during the 1990s. See Young, Douglas J. and Lucanus Martin (2003) "Moving In or Moving On: Migration Patterns Vary by Age and Region." *Montana Business Quarterly*, 41(4): 23-24.

Figure 8: Net Migration to Montana 2000 to 2010
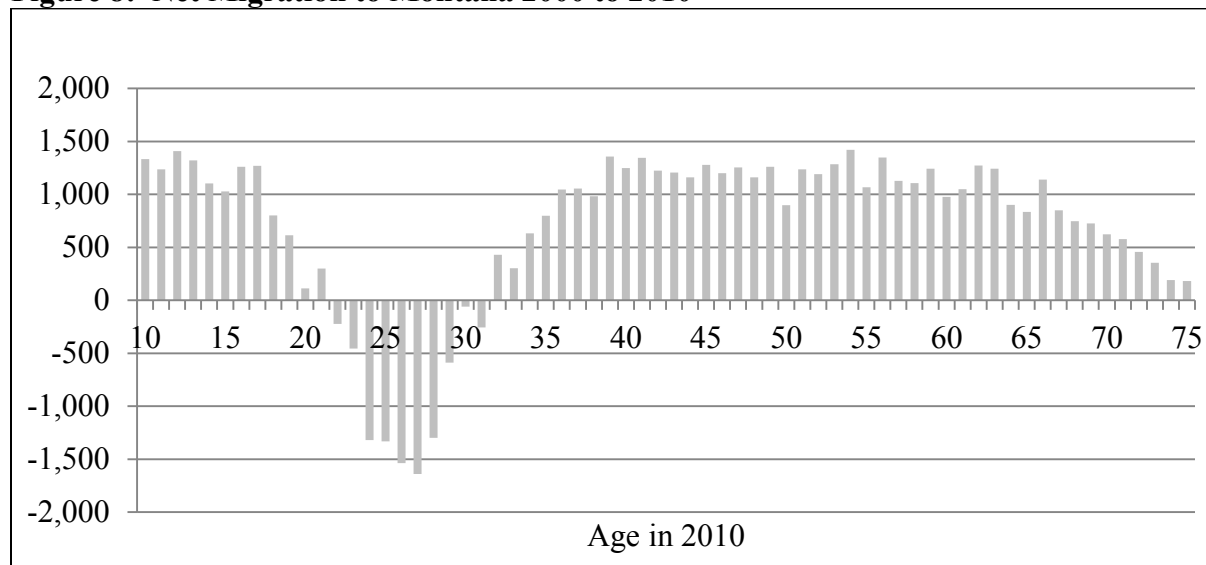
Sources: U.S. Census and CDC

Second, migration varied dramatically by age. A significant number of young people left the state during the 2000s. Specifically, about 8,700 more people age 22-31 left the state than moved in, amounting to about eight percent of this group's population in 2000. Net migration was positive for every other age group. Von Reichert and Sylvester (1997) note that about 60 percent of the people moving to Montana have some sort of tie to the state – either they lived here previously or have relatives in the state.[9] Apparently, they brought their children with them as well – migration increased the number of 10-17 year olds by almost 10,000 during the decade. K-12 enrollment in Montana schools peaked in 1996 and has declined since.[10] In the absence of migration over the last two decades, the peak in enrollment would have been lower and the decline more marked.

Dramatic differences in migration occurred across regions. Figure 9 shows that about 60,000 more people moved into the Western/Southern part of Montana than moved out.[11] Net

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[9] *Montana Business Quarterly*, Bureau of Business and Economic Research, Winter 1997.
[10] See www.opi.mt.gov/pdf/Measurement/EnrollBook2012.pdf for recent trends in enrollment.
[11]Western/Southern Montana is roughly the counties to the west of the Rocky Mountain crest, plus the southern tier as far east as Carbon and Stillwater counties. Specifically, Western/Southern Montana includes Gallatin, Missoula, Flathead, Ravalli, Lewis and Clark, Lake, Jefferson, Stillwater, Sanders, Carbon, Lincoln, Park, Broadwater, Madison, Beaverhead, Silver Bow, Mineral, Powell, Sweet Grass, Granite, and Deer Lodge counties. The balance

migration was positive for every age group except 24-31 year olds, and included substantial

numbers of children.

Figure 9: Net Migration to Western/Southern Montana 2000 to 2010

Age in 2010
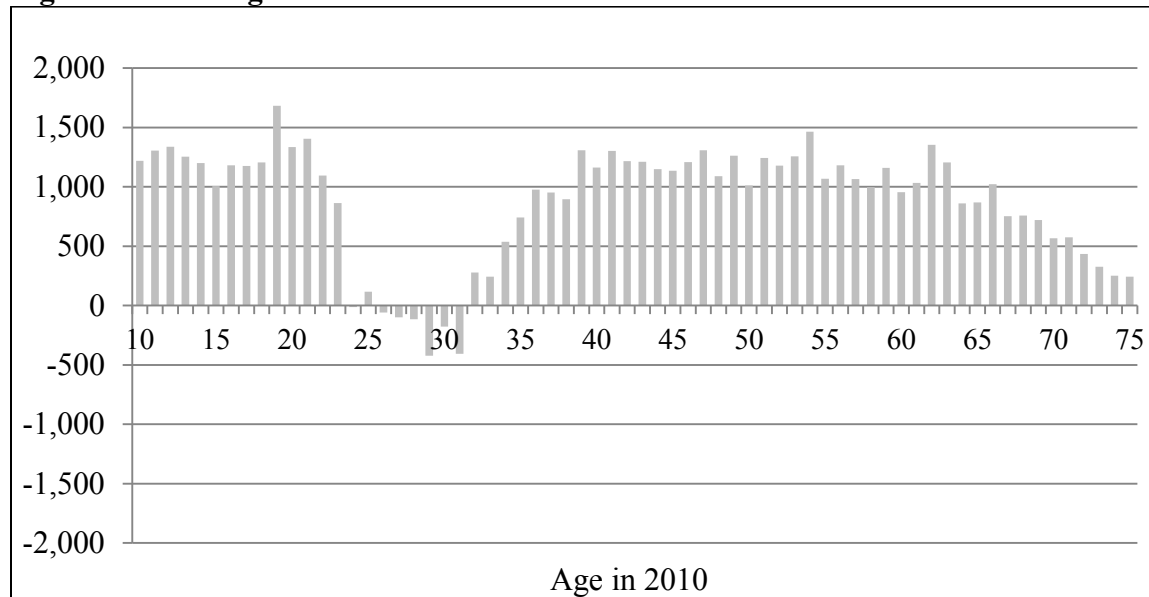
Sources: U.S. Census and CDC

Movement to the Western/Southern region was the result of several forces. First, most of

Montana's major trade centers (except Billings and Great Falls) are located in this region.

Wholesale and retail trade, business, health, and other services have been among the fastest

growing sectors of the economy, and they are concentrated in the trade centers. Second, some

businesses in nontraditional industries were created or expanded, including high-tech firms such

as RightNow Technologies in Bozeman and Applied Materials in Kalispell. Third, Stillwater

and Sweet Grass counties in the south experienced substantial growth related to mining

developments in the area. Fourth, some people moved to Western/Southern Montana as a

retirement destination, as evidenced by the over 60 age group. Lastly, Montana's largest

universities are located in Gallatin and Missoula counties. Thus, Western/Southern Montana

of the state is referred to as Eastern/Northern Montana with the exception of Yellowstone County, which has a large
metropolitan area and is in a separate category altogether.

experienced net in-migration of 18 to 23 year olds. Net migration becomes negative for people in their late twenties such as college graduates who leave the region.

Yellowstone County is the most populous in the state with nearly 150,000 people in 2010, about 15 percent of the statewide total. It is affected by many of the same factors as some of the counties in western Montana. Yellowstone is by far the largest and most important trade center in the state, a major center for health care, and headquarters for oil, gas and coal industries. Migration to Yellowstone County was similar to Western/Southern Montana with the exception of ages 18 to 30 (Figure 10). In contrast to Western/Southern Montana, net migration is negative for 18 to 20 year olds as they head to college in the western part of the state. As Montana's largest city, Billings offers more opportunities for young professionals, causing net in-migration for people in their late twenties.

Figure 10: Net Migration to Yellowstone County 2000 to 2010
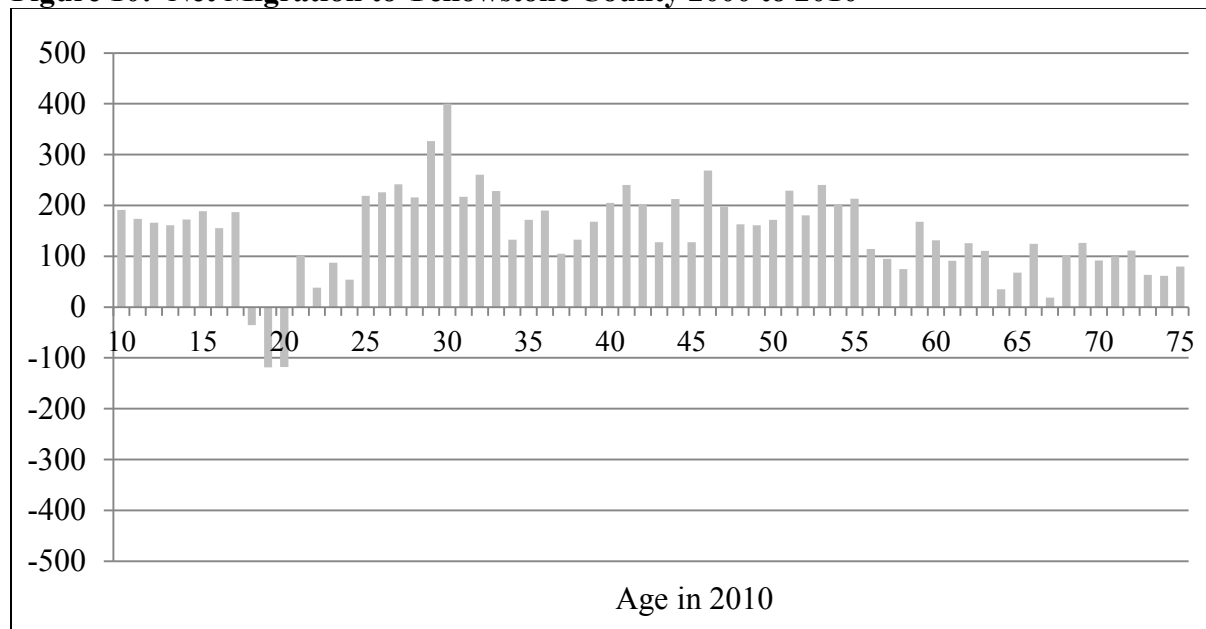
Sources: U.S. Census and CDC

Migration had a much different impact on Eastern/Northern Montana. Figure 11 shows that almost 12,000 more people moved out than moved in. Almost all of the population loss was in the 18-29 year old age group. Net out-migration amounted to 26 percent of this group's 2000

population. One reason for young people to move is to attend college, and most of Montana's

students are enrolled in the Western/Southern part of the state. Although some of these people

return home after school, many others stay on in the growing areas of the state or leave Montana

entirely. The trend toward lower population in rural areas has been going on for many years,

driven in large part by the increasing scale of agricultural production, fewer employment

opportunities, reductions in transportation costs that encourage people to shop further from

home, and the concentration of advanced health care facilities in the major urban areas.

Figure 11: Net Migration to Eastern/Northern Montana 2000 to 2010
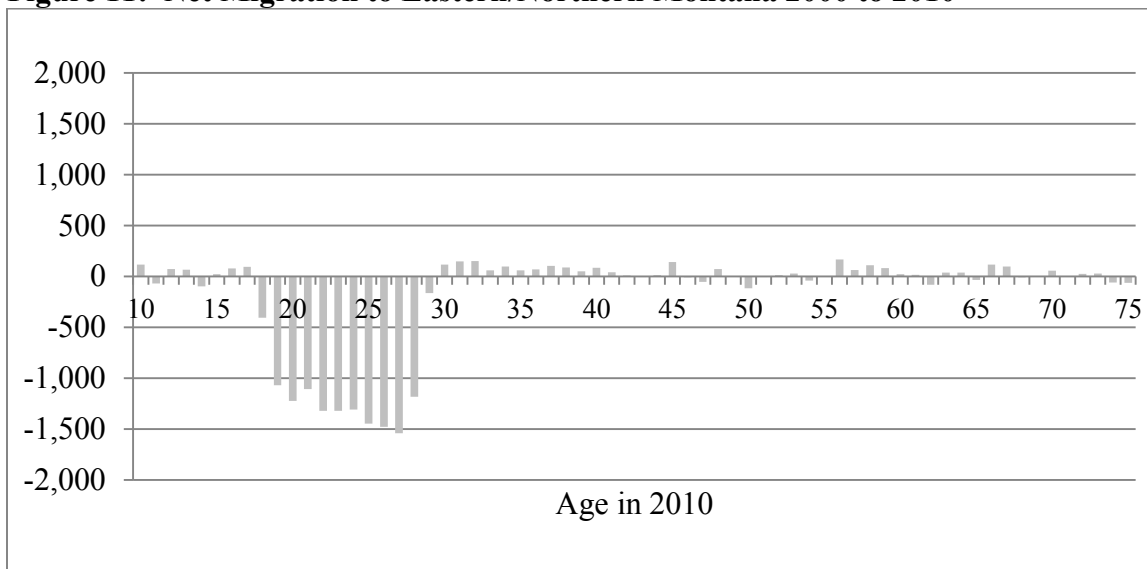
Sources: U.S. Census and CDC

FISCAL IMPACTS OF AGEING

Montana's changing age composition will have a variety of effects on the fiscal affairs of state and local governments in Montana. This report first describes expenditure and revenue as of 2009 and then considers the impact of changing age composition on selected fiscal categories.

Montana State and Local Government Finances

Table 2 displays the consolidated finances of state and local governments in Montana for Year 2009, the latest available from the U.S. Census Bureau. Duplicative transfers between the state and local governments have been eliminated. For example, income tax revenue received by the state and then transferred from the state to school districts to fund K-12 expenditures is only counted once as revenue and once as expenditure. Dollar figures are divided by the total Montana population to determine the expenditure per Montanan.

Table 2: State and Local Government Finances Fiscal Year 2009 in Dollars per Montanan

General Revenues		General Expenditures	
Taxes Total	$ 3,559	Education Total	$ 2,619
Property Taxes	$ 1,301	K-12	$ 1,626
Individual Income Taxes	$ 844	Higher Education	$ 844
Corporate Income Taxes	$ 168	Other Education	$ 149
Sales Taxes	$ 545	Social Services	$ 1,656
Other Taxes	$ 701	Transportation	$ 911
Transfers from Federal Government	$ 2,373	Public Safety	$ 613
Charges and Fees	$ 1,077	Environment/Comm. Development	$ 654
Miscellaneous General Revenue	$ 1,017	Administration	$ 548
Interest Earnings	$ 296	Interest on General Debt	$ 227
Other Miscellaneous	$721	Other General Expenditure	$ 342
Subtotal General Revenues	**$8,025**	**Subtotal General Expenditures**	**$7,570**
Other Revenues		**Other Expenditures**	
Utility	$ 120	Utilities (Water, Electric, Gas)	$ 169
Liquor Stores	$ 69	Liquor Stores	$ 63
Insurance Trusts	$ (970)	Insurance Trusts	$791
Grand Total	**$7,244**	**Grand Total**	**$8,593**

Source: U.S. Census Bureau, State and Local Government Finances by Level of Government and State in FY 2008-09 www2.census.gov/govs/estimate/09slsstab1b.xls. Expenditures include capital. Population is average of calendar 2008 and 2009

The upper portion of the table describes General Revenues and Expenditures, while the lower portion includes items that are normally "off-budget," including municipal utilities, liquor stores, and the insurance trusts (Unemployment, Workers' Compensation, and Public Employee retirement). Note that general expenditures and revenues, as defined by the U.S. Census Bureau and reported in Table 2, include many categories that are outside of Montana's State General Fund. These include funds that Montana considers "special" such as gas taxes to fund highways. Higher education expenditures include instruction, research, extension, university dormitories and food services; revenues include tuition and fees, grants and contracts, and student charges for dormitories and food service.

The largest source of revenue for state and local governments is taxes at $3,559 per person. Property taxes account for $1,301 of the total, individual income taxes for $844, and corporate income taxes for $168. Montana does not have a general sales tax, but selective sales (or excise) taxes on motor fuel, alcoholic beverages, tobacco, public utilities, life insurance, accommodations, and other products and services account for $545 per person. Other taxes, including vehicle license taxes and severance taxes on natural resources, account for the other $701 per person in taxes.

Transfers from the federal government to state and local governments were $2,373 per person. About 40 percent of transfers were to the Department of Public Health and Human Services to partially fund Medicaid and other services. Montana also continues to receive significant transfers for highways, K-12 and higher education, and other programs. Montana state and local governments received $1,077 per person in revenue from numerous charges and fees. The largest single recipient is higher education at $428 per Montanan, including tuition, charges for auxiliary operations such as dormitories and food service, grants and contracts, and other revenues. Charges also include sewerage and solid waste management, parks and

recreation, school lunches, and many others. Miscellaneous general revenue was $1,017 per person including interest earned of $296 per person.

The largest category of Other Revenues is insurance trust receipts. Retirement revenue exceeds current expenditure in most years as the funds accumulate surpluses to pay for future retirement obligations. However, the Census Bureau recognizes losses on invested assets of the trust funds as negative revenue. In Fiscal Year 2008-2009, losses on invested assets exceeded current contributions of employees and employers by $970 per Montanan.[12]

The largest functional category of expenditure is education at $2,619 per Montanan. Education includes K-12, the university system, and some other spending including libraries. Spending on social services, including both health and welfare, is $1,656 per person, and transportation (mostly highways) is $911 per person. Public safety, including police, fire and corrections, is $613 per person. Spending on the environment and housing, including parks and recreation, community development, sewerage, and solid waste management, is $654 per person. Government administration, including financial and judicial administration, is $548 per person. Interest paid on general debt is $227 per person and other general expenditures amounted to $342 per person. The largest category of "non-general" expenditures is the insurance trusts, which account for $791 per person of spending.

Ageing Impacts on Expenditure

This section evaluates the direct impacts of the changing age distribution on expenditure for K-12 education, higher education, corrections, and Medicaid. The initial analysis is limited to the impact of changes in the age distribution; all other factors are assumed to be constant.

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[12] Losses were concentrated in the retirement funds, while the Unemployment and Workers Compensation funds showed positive revenues. As a result of these losses and other factors, employee retirement funds face significant challenges. However, these challenges are not primarily a result of changes in the age distribution, which is the focus of this study. More information is available from the report, "Examination of Pension Challenges" prepared by the Legislative Fiscal Division and Legislative Services Division (June 2012).
http://leg.mt.gov/content/Publications/fiscal/interim/2012_financemty_June/Examination%20of%20Pension%20Challenges.pdf

Thus, we assume constant real expenditure per student in K-12 and higher education, constant costs per person involved with the correctional system, and constant costs per person for both elderly and non-elderly clients under Medicaid. We also assume constant "participation" rates, e.g. that enrollment in the public schools is a constant percentage of the population ages 5 to 17. No doubt inflation will affect nominal expenditure for each of these services, citizens may choose to spend more or less per student in real terms, enrollment rates may increase or decrease, and health care costs may increase faster than the overall rate of inflation. Initially, our method isolates the effects of changing age distribution by holding all of these other factors constant. Then we discuss trends in selected costs and revenues.

K-12 Education Expenditure

Table 3 describes basic facts on K-12 education in Year 2009-10, which is the base year for the projections. Total expenditure of school districts, plus Office of Public Instruction, were $1.5 billion dollars.[13] Public school enrollment of 141,807 was 88 percent of the population age 5 to 17, based on the 2010 U.S. Census population data.[14] Expenditure was $10,528 per student, or $1,509 per Montana resident.

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[13] Montana Office of Public Instruction, Expenditures by Function by Enrollment Category FY2010 http://opi.mt.gov/pub/index.php?dir=School%20Finance/OPICoreDataFiles/PerPupil/&file=Perpupil1991_2011.xls Use Tab: 10obj_NO_ARRA_NO_SFSF 2.) Montana Legislative Fiscal Division, OPI summary, Base Fiscal 2010 - Total Costs http://leg.mt.gov/content/Publications/fiscal/fr_2013/Volume%204/section%20E/OPI.pdf - Pg 10
[14] U.S. Census 2010 population data from http://2010.census.gov/2010census/data/

Table 3: K-12 Education Expenditure in Fiscal Year 2009

Total Expenditure	$ 1,492,885,133
Public School Enrollment Fall 2009	141,807
Participation Rate: Enrollment/Population 5 to 17	88.0%
Expenditure per Student	$ 10,528
Expenditure per Montanan	$ 1,509

Sources: Montana Office of Public Instruction, Expenditures by Function by Enrollment Category FY2010
http://opi.mt.gov/pub/index.php?dir=School%20Finance/OPICoreDataFiles/PerPupil/&file=Perpupil1991_2011.xls Use Tab: 10obj_NO_ARRA_NO_SFSF
Montana Legislative Fiscal Division, OPI summary, Base Fiscal 2010 - Total Costs
http://leg.mt.gov/content/Publications/fiscal/fr_2013/Volume%204/section%20E/OPI.pdf - pg. 10
Montana Office of Public Instruction, Montana Public School Enrollment Data October 4, 2010
www.opi.mt.gov/pdf/Measurement/EnrollBook2010.pdf – pg 2
U.S. Census 2010 population data

Expenditures for future years are projected by holding the participation rate and cost per student constant.[15] For example, K-12 enrollment in 2030 is projected to be 88 percent times the population age 5 to 17 in 2030, and total expenditure is projected to be enrollment times $10,528. Expenditure per Montanan is obtained by dividing total projected expenditure by projected population in 2030. Thus, changes in total expenditure and expenditure per Montanan depend only on the projected changes in population and the fraction of age 5 to 17.

Figure 12 displays the projected percentage of the population that will be age 5 to 17. The school age population has been shrinking in Montana for a number of years, both absolutely and as a percentage of the total population. The trend through 2030 is for a further decrease. Consequently, K-12 expenditure per Montana resident follows a similar pattern: As the percentage of school age population decreases, so does the per capita burden of paying for schools (Figure 13). The decrease from 2010 to 2030 is $86 per Montanan.

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[15] Montana law requires that the budget proposed by OPI keep up with inflation (MCA 2007: 20-9-326, http://data.opi.mt.gov/bills/mca/20/9/20-9-326.htm). This is consistent with our assumption of constant real expenditure per student

Figure 12: Percent of Montana Population Age 5 to 17
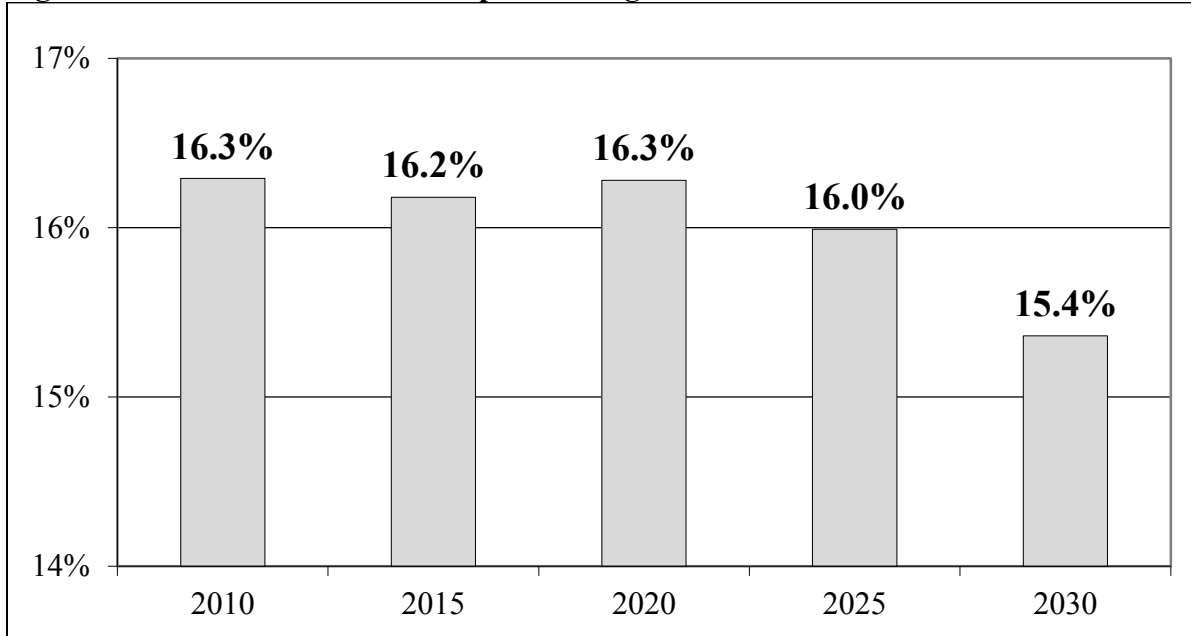
Source: 2010 U.S. Census. Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data.

Figure 13: K-12 Expenditures per Montanan
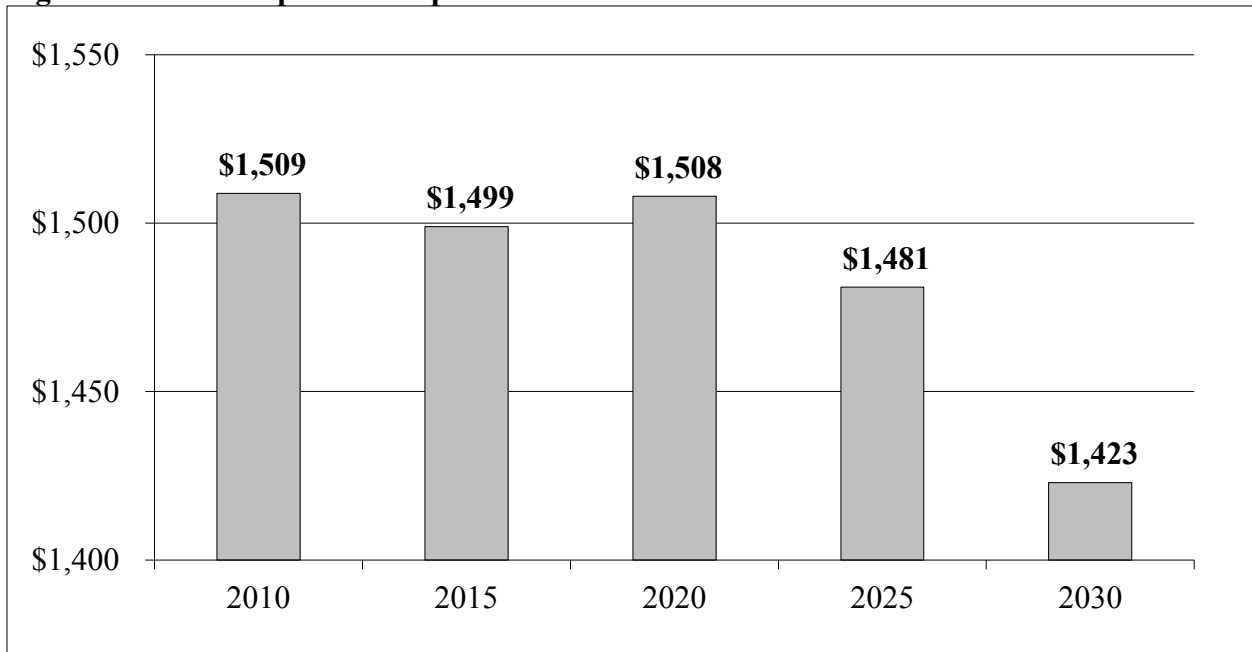
Source: 2010 U.S. Census. Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data.

It is worth repeating that these projections do not take account of any future changes in participation (enrollment) rates or real spending per student. Rather, the projections isolate the impact of changing age distribution, assuming that all other factors remain constant. In fact, real

spending per student has increased from $4,135 per student in fall enrollment in 1969-70 to

$9,923 in 2007-08 (Table 4).[16] Annual rates of increase were most rapid in the 1970's (4.2% per

year) and slowest during the 1980s (1.1% per year). If spending per student continues to rise at

the average rate since 1970 (2.3% per year), expenditure per Montanan will be significantly

higher by 2030 at $2,242 rather than $1,423 as reported in Figure 13.

Table 4: Current Expenditure per Student in Fall Enrollment

	Academic Year				
	1969-1970	**1979-1980**	**1989-1990**	**1999-2000**	**2007-2008**
Montana	$4,135	$6,259	$7,168	$8,006	$9,923
USA	$4,269	$5,775	$7,849	$8,765	$10,441
	Annual % Increase				
	1969-70 to 1979-80	**1979-80 to 1989-90**	**1989-90 to 1999-00**	**1999-00 to 2008-09**	**1969-70 to 2007-09**
Montana	4.2%	1.4%	1.1%	2.2%	2.3%
USA	3.1%	3.1%	1.1%	1.8%	2.4%

Source: NCES, Digest of Educational Statistics 2010. Table 193
Current expenditure excludes capital
Expenditure for state administration are excluded in all years except 1969-70 and 1979-80
Beginning in 1989-90, survey was expanded and coverage was improved.
Some data have been revised from previously published figures
Fall enrollment differs from Montana's Average Number Belonging (ANB)

Higher Education Expenditures

Basic data on higher education are displayed in Table 5. Expenditures include only the

instructional appropriations for the Montana University System, including the monies for the

community colleges in Custer, Dawson, and Flathead counties. Appropriations for the Montana

Agricultural Experiment Station, Extension, Bureau of Mines, Fire School, research, other

activities, dormitories and food service, and "one time only" are excluded.[17] Total expenditure

appropriated by the state for instruction was $152 million dollars in fiscal year 2010. Counties

provided an additional $8 million dollars in support of the community colleges. Full time

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[16] These figures differ slightly from those in Table 3, because they are for a different year and the National Center for Educational Statistics' measure of fall enrollment differs from Montana's measure of Average Number Belonging (ANB).

[17] Sources: F. Houser, Montana University System, *HISTORICAL FUNDING - EDUCATIONAL UNITS ONLY*, PEPB 2007-2008\Staff Reports\State_Percent_Share_History_Through_2009_Bien (Jan 10, 2008 Updated). County appropriations from IPEDS

equivalent resident enrollment in the same period was 31,222, which represented a participation rate of 33% of the population age 18 to 24. The appropriation per student was $5,126 and cost per Montana resident was $162. Future expenditures are projected by assuming that the participation rate of 33% and state appropriation per student of $5,126 remain constant.

Table 5: University System Instructional Expenditure Year 2010

Total Appropriations	$ 160,052,417
State Appropriation	$ 151,947,492
Local Appropriations	$ 8,104,925
FTE Resident Enrollment	31,222
Participation Rate (Enrollment/Population 18 to 24)	33%
Expenditure per Student	$ 5,126
Expenditure per Montanan	$162

Source: Montana State University

Figure 14 displays the projected percentages of Montana population that will be aged 18 to 24. As the percentage of the population of college age decreases, so does the projected expenditure per Montana resident (Figure 15). The decrease from 2010 to 2030 is about $29 per Montanan, again assuming no other changes except the age distribution of the population. In fact, state funding for higher education instruction has shown no clear trend over the last 15 years on an inflation adjusted per student basis. Increases in enrollment and student tutiton have financed increased instructional spending by Montana's institutions of higher education.[18]

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[18]See "Higher Ed State Share" at http://leg.mt.gov/content/Publications/fiscal/Education/Higher-Ed-State-Share.pdf. Reliable data for the state-wide system including community colleges are only available since 1996.

Figure 14: Percent of Montana Population Ages 18 to 24

Bar chart showing:
- 2010: 9.6%
- 2015: 8.3%
- 2020: 7.6%
- 2025: 7.7%
- 2030: 7.9%
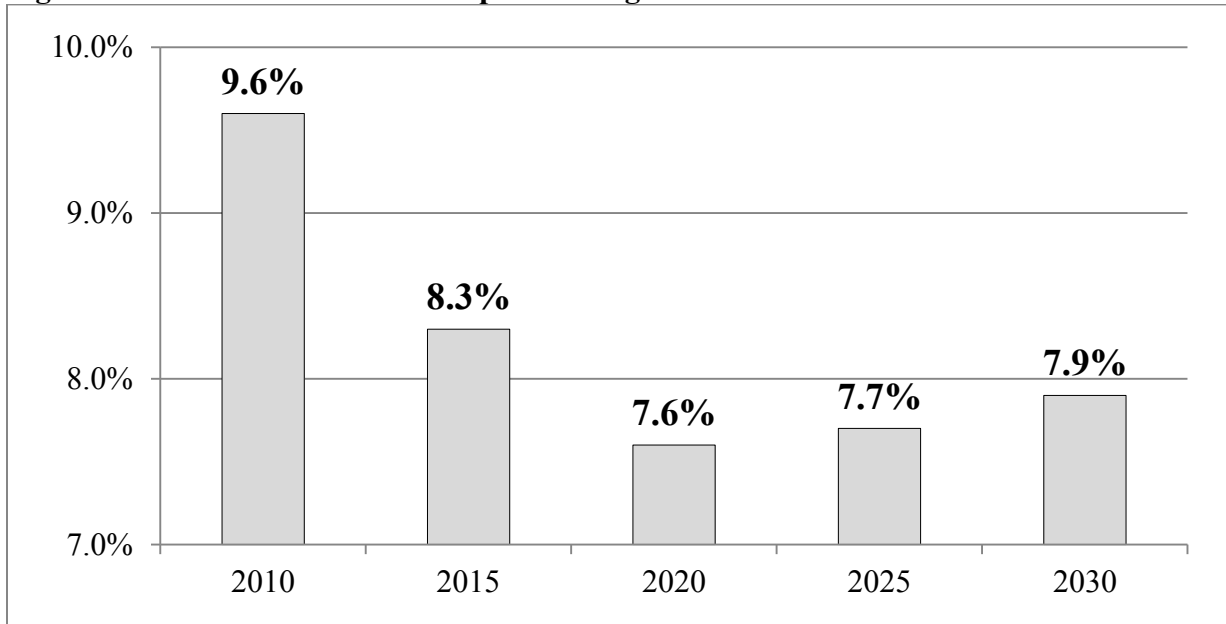
Source: Year 2010 U.S. Census Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Figure 15: Higher Education Expenditure per Montanan

Bar chart showing:
- 2010: $162
- 2015: $140
- 2020: $129
- 2025: $130
- 2030: $133
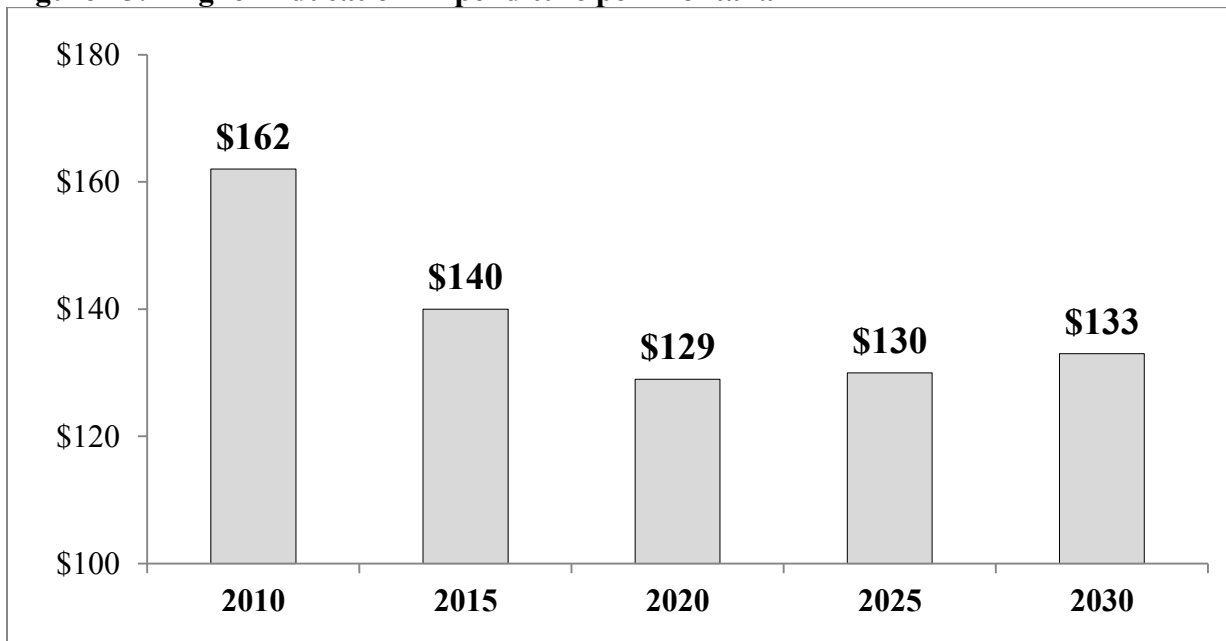
Instruction only. Excludes MAES, ES, Fire school, Bureau of Mines, Grants and Contracts, etc.
Sources: MUS OCHE, Population Data: Year 2010 Census. Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Corrections Expenditure

Because there are more kinds of programs with varying participation rates by age, corrections expenditures are more complicated to analyze than K-12 and higher education. Basic data on participation and daily cost for corrections programs are displayed in Table 6.[19] The 2,524 inmates include those in the state prisons and about 900 prisoners who are "contracted out" to other prisons. There are about four times as many men and women on parole and probation as inmates, but the cost per participant is much less. The Youth Services programs which are administered by the Department of Corrections include Riverside and Pine Hills Youth Correctional Facilities, and the Youth Transition Centers. The Youth Courts, which are administered by the Department of Justice, include a wide range of youth probation and other services, ranging from AA/NA meetings to Family Services to Life Skills Training to Victim/Offender Mediation, and many other programs. Other Adult Services include Pre-Release programs, START programs, and the Adult Intensive Supervision Program, among others.

Table 6: Participation and Daily Expenditures for Corrections

Category	Number (2012)	Expenditure (2010)
Inmates (Excluding County Jails)	2,524	$ 89.81
Department of Corrections		
Probation/Parole	8,419	$5.92
Youth Services	133	$230.90
Department of Justice (2010)		
Youth Courts	5,185	$2.84
Other Adult Services	1,882	$68.45

Sources: D. Hall, Montana Department of Corrections for participants by age. B. Peake, Montana Department of Justice for youth court participants.
Costs from Montana Department of Corrections 2011 Biennial Report and Montana Judicial Branch Youth Court At-A-Glance 2010

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[19] Sources: D. Hall, Montana Department of Corrections for participants by age. B. Peake, Montana Department of Justice for youth court participants. Costs from Montana Department of Corrections 2011 Biennial Report http://www.cor.mt.gov/content/Resources/Reports/2011BiennialReport.pdf and Montana Judicial Branch Youth Court At-A-Glance 2010 http://courts.mt.gov/content/dcourt/yth_court/docs/reportcard 2010.pdf

Table 7 displays estimated participation rates for the various programs, cross tabulated by age. These estimates are based on data provided by the Department of Corrections and the Youth Courts. The probability of being an inmate is highest in the 25 to 44 age group, while very few elderly people are in prison. Probation/parole rates are highest in the 18 to 44 age groups. A striking feature of the table is that about one in twelve youth age 14 to 17 is involved with the Youth Courts.

Table 7: Participation in Montana Correctional System (2012)

Category / Age Group	10 to 13	14 to 17	18 to 24	25 to 44	45 to 64	65+
Inmate	0.0%	0.0%	0.32%	0.55%	0.28%	0.05%
Department of Corrections						
Probation/Parole	0.0%	0.0%	1.11%	1.90%	0.90%	0.11%
Youth Services	0.0%	0.27%	0.00%	0.00%	0.00%	0.00%
Department of Justice (2010)						
Youth Courts	1.86%	8.26%	0.01%	0.00%	0.00%	0.00%
Other Services	0.0%	0.0%	0.36%	0.46%	0.14%	0.01%
Total	**1.9%**	**8.5%**	**1.8%**	**2.9%**	**1.3%**	**0.2%**

Sources: MT DOC and DOJ

Average correctional expenditure by age is calculated by multiplying the participation rate by the annual cost of each service and then summing across services. The result is displayed in Figure 16. Costs are high in the 14 to 17 age group, because of the high cost per participant of residential youth programs, which include schooling. The highest cost group is ages 25 to 44 who have the highest likelihood of being inmates. Eighteen to 24 year olds are slightly less likely to be inmates or otherwise under the jurisdiction of the courts. Costs diminish markedly for people age 45 to 64 because their participation rates are relatively low and very few people age 65+ are involved with the correctional system.

Population projections suggest that correction expenditure per resident will decline in coming years (Figure 17). The overall decline from 2012 to 2030 is $20 per Montanan. However, national data indicate that correctional expenditure per participant increased 0.5

percent per year since 1980, in addition to inflation. [20] If that trend were to continue from 2012

to 2030, correctional expenditure would rise to $160 per Montanan, rather than the $146 shown

in Figure 17.

Figure 16: Correctional Expenditure per Montanan by Age
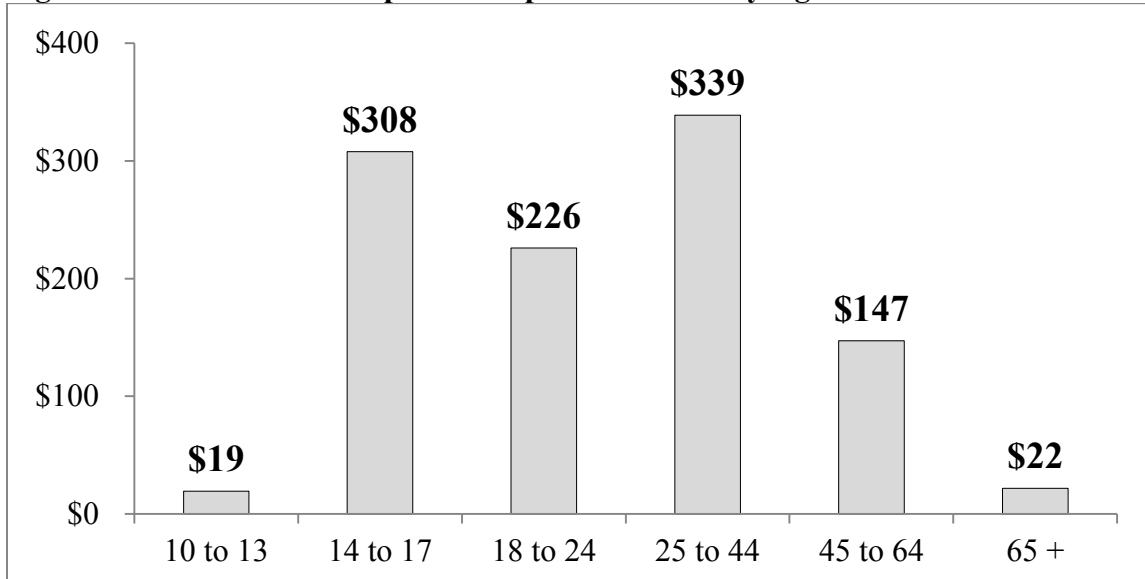
Source: MT DOC and DOJ Population: Year 2010 U.S. Census.

Figure 17: Correctional Expenditure per Montanan
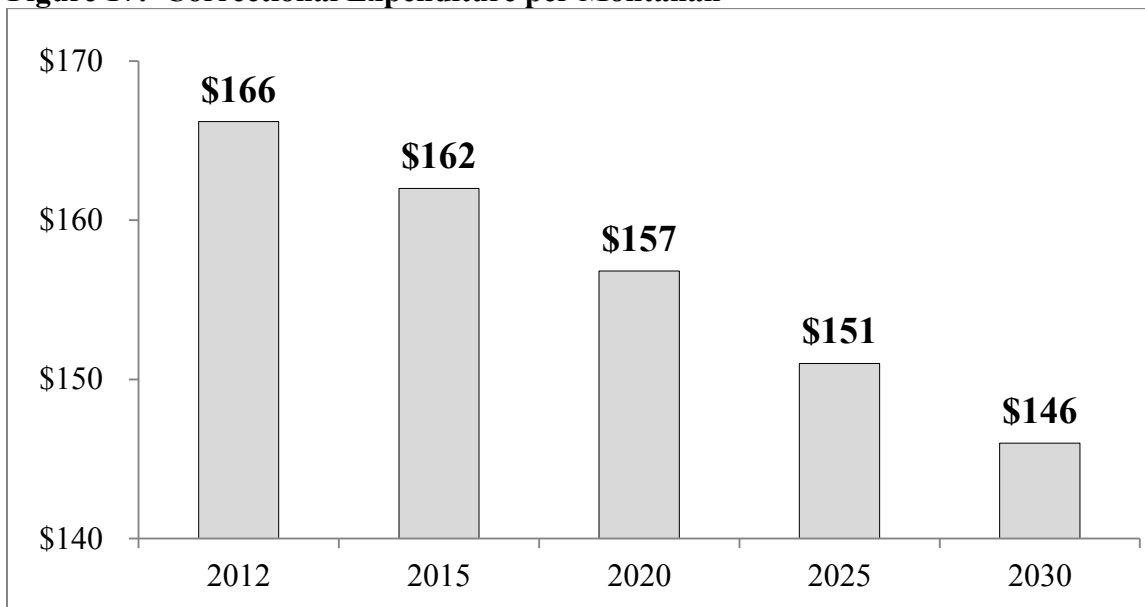
Source: MT DOC and DOJ Population: Year 2010 U.S. Census. Years 2012 to 2030 are estimates using the U.S. Census
projections re-weighted with 2010 U.S. Census Data (included in 2012 are the 2010 Youth Court Numbers)

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[20] Congressional Budget Office, "Long Term Budget Outlook, 2012," p. 53
www.cbo.gov/sites/default/files/cbofiles/attachments/06-05-Long-Term_Budget_Outlook.pdf

Medicaid Expenditure

Private insurance, Medicare (a Federal government program) and Medicaid (a Federal and State government program), and out-of-pocket spending will share in covering the nation's medical expenses. This section examines the Medicaid expenditures paid by State government for the elderly (65 years of age and older), blind and disabled, adults between 18 and 64 years of age, and children (age 0 - 17).[21] Medicare expenditures are not included in this study because the program is administered by the Federal government and the State has no financial responsibility for Medicare expenditures. Expenditure and participation data for the elderly, blind and disabled, adults, and children were obtained from the Montana Medicaid Program.[22] Estimated expenditures for long-term care services, including nursing homes, assisted living and swing bed care were obtained from a report by the Kaiser Family Foundation and Montana Department of Health and Human Services.[23]

Total Montana Medicaid expenditures by the Federal and State government totaled $915 million in fiscal year 2010 (Table 8). State expenditures for all Medicaid programs totaled $204 million in fiscal year 2010 and served over 81,500 participants. In 2010, the elderly represented 7.5 percent of the participants and 19.4 percent of the expenditures; blind and disabled represented 23.4 percent of the participants and 47 percent of the expenditures; other adults represented 14 percent of the participants and 13.3 percent of the expenditures and children represented 55 percent of the participants and 20.2 percent of the expenditures. The elderly were

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[21] In the Medicaid discussion youth are referred to as children and the working age as adults to be consistent with Medicaid vernacular.

[22] Table 1 Summary of Public Assistance and Medical Care, State Fiscal Year 2010. Montana Department of Public Health and Human Services. www.dphhs.mt.gov/statisticalinformation/tanfstats/sfy2010/table1.pdf. Downloaded on May 31, 2012; and, Montana Medicaid Program, State Fiscal Years 2009/2010, Report for the 2011 Legislature, page 34. www.dphhs.mt.gov/2011biennialreport/mtmedicaidreport.pdf . Children covered under the Children's Health Insurance Program (CHIP) are not included.

[23] Kaiser Commission on Medicaid and the Uninsured, issue paper, The Henry J. Kaiser Family Foundation, November 2006.

the highest cost per participant ($6,477), while children were the lowest cost per participant ($919).

Table 8: Montana Medicaid Expenditures in Fiscal Year 2009 - 2010

Description	Total	Elderly	Blind and Disabled	Adults	Children
Federal and State Expenditures for Medicaid	$915,129,130	$177,535,051	$430,110,691	$121,712,174	$184,856,084
State Expenditures for Medicaid (22.35%)	$204,531,361	39,679,084	$96,129,739	$27,202,671	$41,315,335
Number of participants	81,597	6,126	19,059	11,433	44,979
Participation Rate	8.2%	4.2%	14.6%	1.9%	18.9%
Expenditure per Participant	$2,507	$6,477	$5,044	$2,379	$919
Expenditure per Montanan	$207	$40	$97	$27	$42

Sources: Montana Medicaid Program, State Fiscal Years 2009/2010, Report for the 2011 Legislature, page 9 and Summary of Public Assistance and Medical Care, State Fiscal Year 2010. Montana Department of Public Health and Human Services. www.dphhs.mt.gov/statisticalinformation/tanfstats/sfy2010/table1.pdf.

These expenditures were allocated among expenditures for physical health ($642 million), mental health ($108 million) and other payments and adjustment made outside of the Medicaid payment system ($165 million). The State portion of Medicaid expenditures totaled nearly $205 million (22.35 percent of total Federal and State Medicaid expenditures). However, the 22.35 percent of expenditures paid by the State of Montana in 2010 was the lowest percentage over the past decade because of the enhanced Federal Medicaid matching funds from the American Recovery and Reinvestment Act of 2009. Projections made by the Montana Department of Public Health and Human Services (MDPHHS) in 2010 suggest that the state's share will increase to 34 percent or higher by fiscal year 2013.[24]

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[24] Montana Medicaid Program, State Fiscal Years 2009/2010, Report for the 2011 Legislature, page 34. www.dphhs.mt.gov/2011biennialreport/mtmedicaidreport.pdf The state share of Medicaid is assumed to be 22.4% in 2010, 25.4% in 2011, 33.8% in 2012, and 34.3% in 2013.

Figure 18: Medicaid Expenditures per Montanan, 2010 to 2030
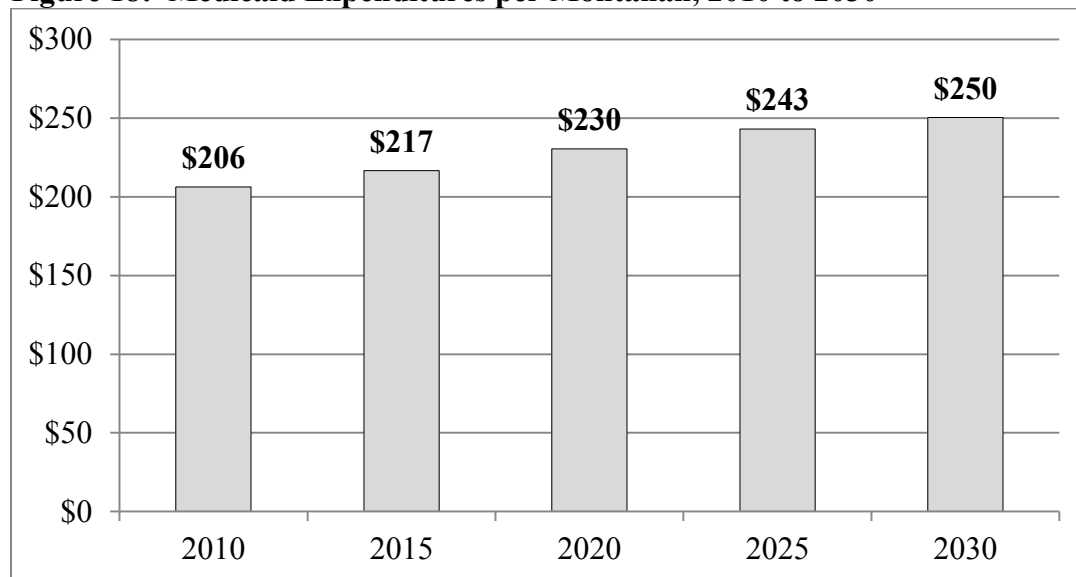
Medicaid expenditure per Montanan ($206) is calculated by dividing the $204.5 million of expenditures by the Montana population for 2010. Medicaid expenditures per Montanan in 2010 for the elderly, blind and disabled, adults, and children were $40, $97, $27, and $42, respectively (Table 8). Changes in the age distribution are forecasted to increase total Medicaid expenditures per Montanan paid by the State by 21.4 percent from $206 per Montanan in 2010 to $250 per Montanan in 2030 (Figure 18).

The elderly population is forecast to grow from 146,742, or 14.8 percent of the population in 2010 to 272,870, or 25.6 percent of the population in 2030. Over 4 percent of the elderly population participates in Medicaid. Medicaid expenditures for the elderly will increase from 19.4 percent in 2010 to 27.6 percent of Medicaid expenditures in 2030. In this case, Medicaid expenditures for the elderly paid by the State are expected to increase by over 72 percent from $40 per Montanan in 2010 to $69 per Montanan in 2030 (Figure 19).

Figure 19: Medicaid Expenditures per Montanan by Medicaid Group, 2010 to 2030
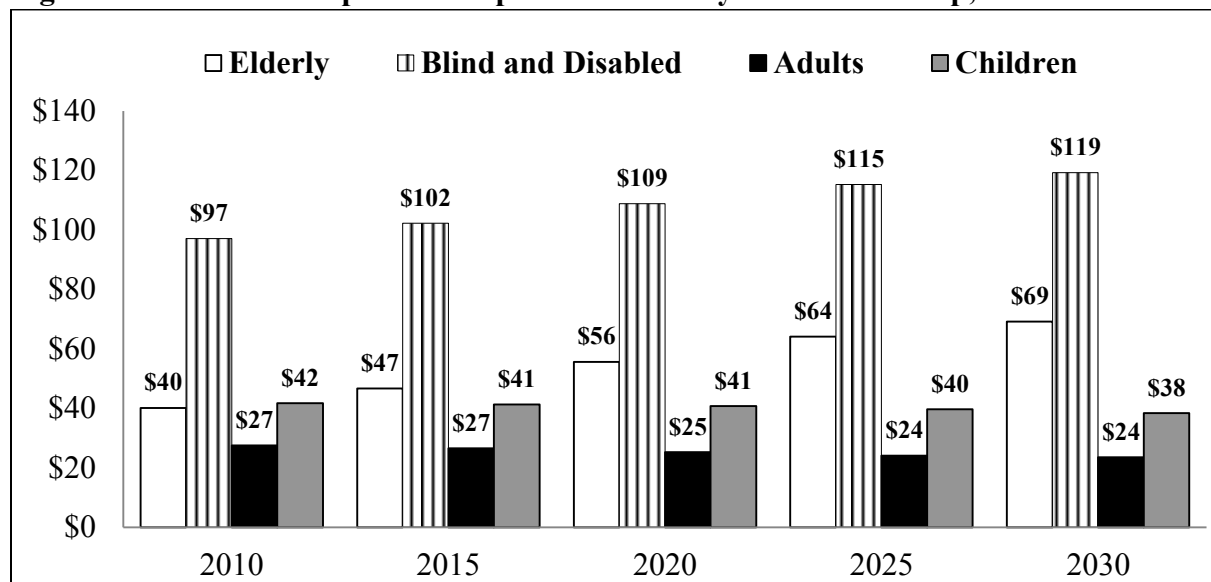
Sources: Bureau of Census and Montana Medicaid Program, State Fiscal Years 2009/2010, Report for the 2011 Legislature

The blind and disabled population is expected to grow from 130,332, or 13.2 percent of the population in 2010 to 172,435, or 16.2 percent of population in 2030. Over 14.5 percent of the disabled population participates in Medicaid.[25] The population of blind and disabled persons was estimated by assuming that 4.0 percent of children, 10.9 percent of adults 18 to 64 years of age, and 37.4 percent of the elderly have at least one disability.[26] Medicaid expenditures for the blind and disabled paid by the State are expected to increase nearly 23 percent from $97 per Montanan in 2010 to $119 per Montanan in 2030.

The adult population is expected to decline from 619,110, or 62.6 percent or the population in 2010 to 572,454, or 53.7 percent of the population in 2030. Medicaid participation for the adult population, ages 18 to 64, is less than 2 percent. Medicaid expenditures for these adults paid by the State are expected to decrease by 12 percent from $27 per Montanan in 2010 to $24 per Montanan in 2030.

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[25] The American Community Survey, 2008 to 2010 only estimates the population of disabled person, not blind and disabled persons.

[26] American Community Survey, 2008 to 2010, 3 year estimates.

And finally, the number of children is expected to decline from 223,563 or 22.6 percent of the population in 2010 to 221,531, or 20.8 percent of the population in 2030. Over 20 percent of all children, ages 0 to 17, participate in Medicaid. Medicaid expenditures for these children paid by the State will decrease by about 10 percent from $42 per Montanan in 2010 to $38 per Montanan in 2030.

Two important factors will determine the impact on these expenditures paid by the State of Montana: (1) share of Medicaid expenditures paid by the State and (2) increase in Medicaid expenditures per participant above the general rate of inflation. The Congressional Budget Office (CBO) estimates the excess cost growth in spending for health care for four time periods (1975 to 2010, 1980 to 2010, 1985 to 2010, and 1990 to 2010), adjusted for demographic characteristics such as age (Table 9). See Appendix B for the calculation details. The CBO has suggests the that the "rate of excess cost growth in overall health care spending since 1985 best reflects the features of the health care and health insurance systems that are likely to endure for a number of years."[27] If spending per Medicaid beneficiary continues to rise at the average rate since 1985 (2.5% per year), then expenditure per Montanan will be significantly higher by 2030 rising to $410 per Montanan rather than $250 per Montanan.

Table 9: Annual Percentage Increase in Medicaid Expenditures per Participant Above the General Rate of Inflation from 1975 to 2010

1975-2010	1980-2010	1985-2010	1990-2010
3.3%	3.0%	2.5%	1.9%

Source: CBO, see Appendix B

Table 10 assesses the potential impact of changes in the State's share and increases in the in Medicaid expenditures per participant above the general inflation rate. For instance, if the State's share increases by 10 percentage points to 32.35 percent and the rate of increase in

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[27] www.cbo.gov/sites/default/files/cbofiles/attachments/06-05-Long-Term_Budget_Outlook.pdf, page 53

Medical expenditures per participant is the same as the general inflation rate, State Medicaid expenditures for the elderly increase to $362 per Montanan in 2030. If the State's share remains constant and the rate of increase in Medicaid expenditures per participant exceeds the general inflation rate by 2.5 percent each year, then State Medicaid expenditures increase to $410 per Montanan. If the State's share increases by 10 percentage points and the rate of increase in Medicaid expenditures per participant exceeds the general inflation rate by 2.5 percent each year, then State Medicaid physical health expenditures increase to $593 per Montanan.

Table 10: Influence of Changes in the State's Share and Excess Medicaid Expenditures on State Medicaid Expenditures in 2030

Excess Medicaid Expenditures	Percentage Point Increase in State Share by 2030				
	0	5	10	15	20
0.0%	250	306	362	418	474
1.5%	337	412	488	563	638
2.5%	410	501	593	685	777
3.5%	497	609	720	832	943

Sources: Bureau of Census and Montana Medicaid Program, State Fiscal Years 2009/2010, Report for the 2011 Legislature and authors' calculations.

The most substantial change in Medicaid expenditures from 2010 to 2030 is forecast to occur in expenditures for the elderly. This analysis of physical health expenditures for the elderly does not consider trends in Medicaid expenditures. The largest share of State Medicaid expenditures for the elderly pays for long-term care services, such as nursing homes and assisted living facilities. The Kaiser Commission on Medicaid and the Uninsured estimated that 86 percent of Medicaid expenditures for the elderly were used for long-term care.[28] Based on the Kaiser Commission estimate, State Medicaid expenditures on long-term care for the elderly totaled $34 million in fiscal year 2010, or $34 per Montanan (Figure 20). By 2030, changes in the age distribution will increase State Medicaid expenditures on long-term care for the elderly to $59 per Montanan.

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[28] Kaiser Commission on Medicaid and the Uninsured, issue paper, The Henry J. Kaiser Family Foundation, November 2006.

The Montana Department of Public Health and Human Services (MDPHHS) expenditure data on residential facilities are available for all counties in Montana. State Elderly Medicaid physical expenditures on nursing home facilities varied between $137 per capita in Wibaux county to less than $10 per capita in Treasure, Judith Basin, and Gallatin counties in 2010 (Figure 21). Counties with zero expenditures (Golden Valley and Petroleum) in 2010 were not projected to 2030. With the elderly population growing and the state share of Medicaid remaining constant at 22.35 percent, State Medicaid expenditures on the elderly for nursing home facilities are expected to increase to over $125 per capita in the more elderly Eastern Montana counties, such as Powder River, Prairie, Daniels, and Wibaux and remain under $30 in younger counties, such as Lewis and Clark, Missoula, and Gallatin. Figure 22 shows the projected State Medicaid expenditures for the elderly in residential facilities for all Montana counties for 2030. The largest percentage increases in Medicaid expenditures for the elderly in residential facilities is expected to be in Jefferson, Rosebud, and Lewis and Clark counties.

Figure 20: State Medicaid Physical Health Expenditure per Montanan for Long-Term Care and Other Expenditure for Elderly, 2010 to 2030
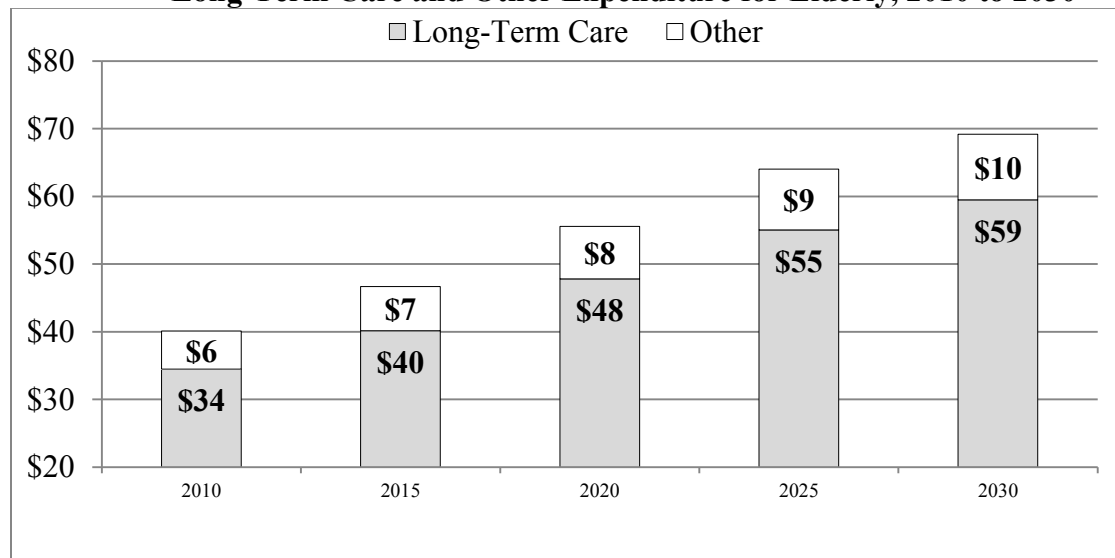
In summary, the elderly population in Montana is projected to use a larger portion of the State Medicaid budget in 2030 than in 2010. Over 85 percent of these benefits to the elderly are expected to be paid for long-term care services throughout the State. These projections only account for the substantial increase in the elderly population. They do not include changes in the share of Medicaid expenditures paid by the state or adjustments for inflation in medical care costs, changes in the mixture of residential and home care services available to the elderly, changes in the physical or mental well-being of the elderly or changes in Federal or state government policy.

Figure 21: State Medicaid Expenditure for the Elderly per County Resident 2010

Elderly Expenditures
per County Resident

- 00 - 34
- 35 - 76
- 77 - 180

Sources: Montana Department of Public Health and Human Services, Statistical Information for 2010, Table 5 (Nursing Home) and 2010 Decennial Census
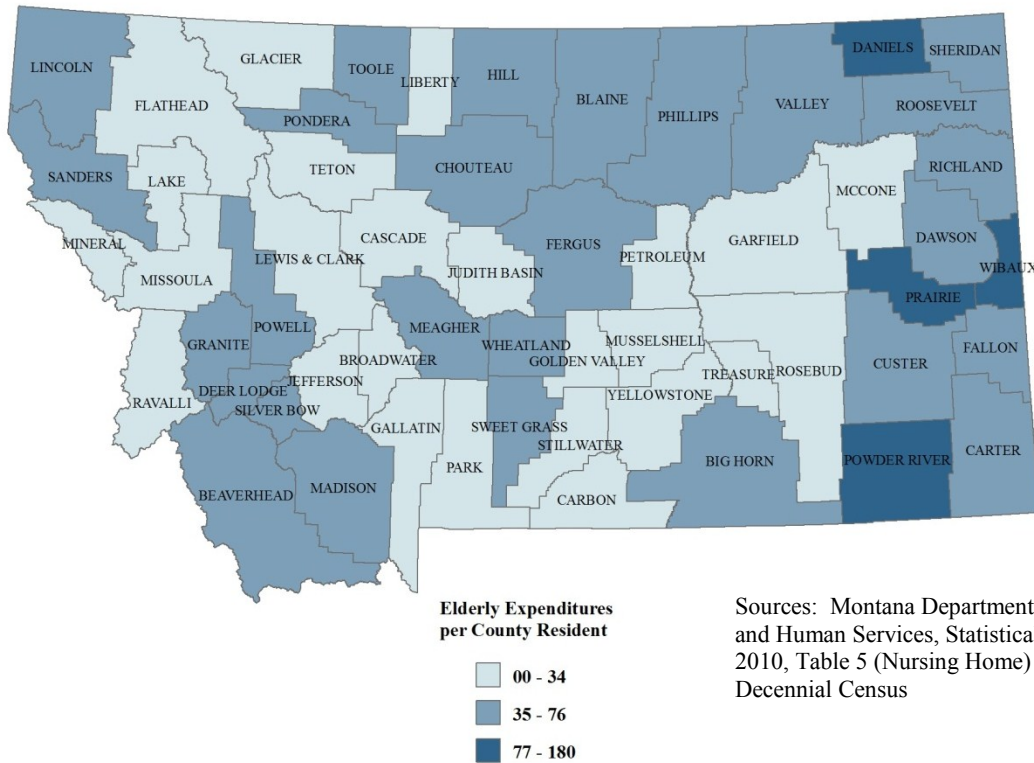
Figure 22: State Medicaid Expenditure for the Elderly per County Resident 2030

Elderly Expenditures
per County Resident

- 00 - 34
- 35 - 76
- 77 - 180

Sources: Montana Department of Public Health and Human Services, Statistical Information for 2010, Table 5 (Nursing Home); 2010 Decennial Census; and NPA, Inc. Population Projections for 2030
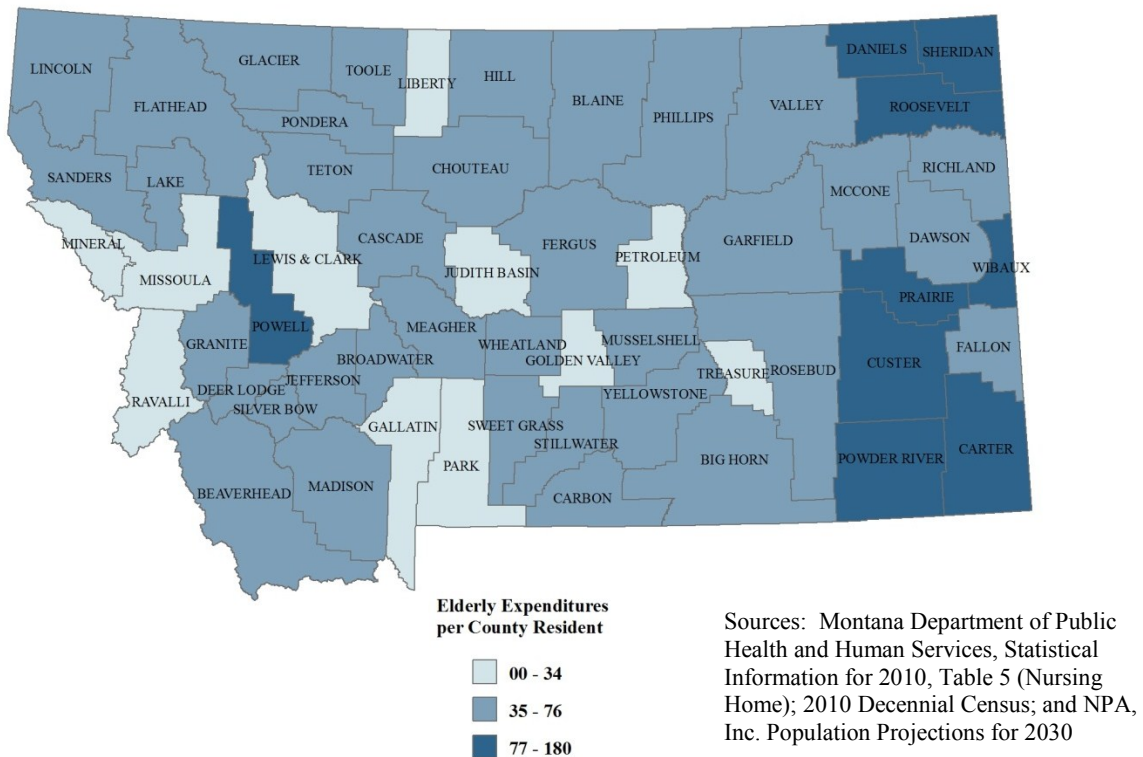
Ageing Impacts on Revenue

Tax revenue will also be affected by population ageing, because individuals pay different amounts of taxes over the life cycle. The very young (school age) population pays almost nothing in taxes. Young adults typically have low incomes and often live in moderate or group housing. Incomes typically peak in older middle age and then decline in the retirement years. Thus, changes in the age distribution may affect tax revenue.

Our methods for projecting the impact of age distribution on tax revenue are similar to those for expenditure. Real (inflation-adjusted) taxes per person by age are assumed to remain constant over the projection period. All other factors, such as per capita incomes, house values, and tax rates, are held constant. Thus, the results isolate the effects of changes in the age distribution on tax revenue.

Residential Property Taxes

In the year 2010 Montana property tax revenue totaled $1.18 billion or about 36 percent of all tax revenue. Residential property taxes were 49.7 percent of all property taxes.[29] Younger people pay relatively little in residential property taxes, both because they are unlikely to be independent heads of household who are usually responsible for property taxes and because the value of the property they live in is comparatively low. Thus, changes in the age distribution of the population may affect total revenue from residential property taxes.[30]

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[29] Sources: U.S. Census State and Local Government Finances http://www.census.gov/govs/estimate/ (percent=property taxes/total tax revenues). Montana Department of Revenue, Biennial Report 2008-2010 (p.139) http://revenue.mt.gov/content/publications/biennial_reports/2008-2010/BiennialReport.pdf. Residential includes Class 4 – Residential plus 3.4 percent of Class 4 - Commercial to account for multifamily housing in the latter classification

[30] For a discussion of determining residential property tax estimates by age see Appendix B

Figure 23: Percentage of Persons in Each Age Group who are Head of Household
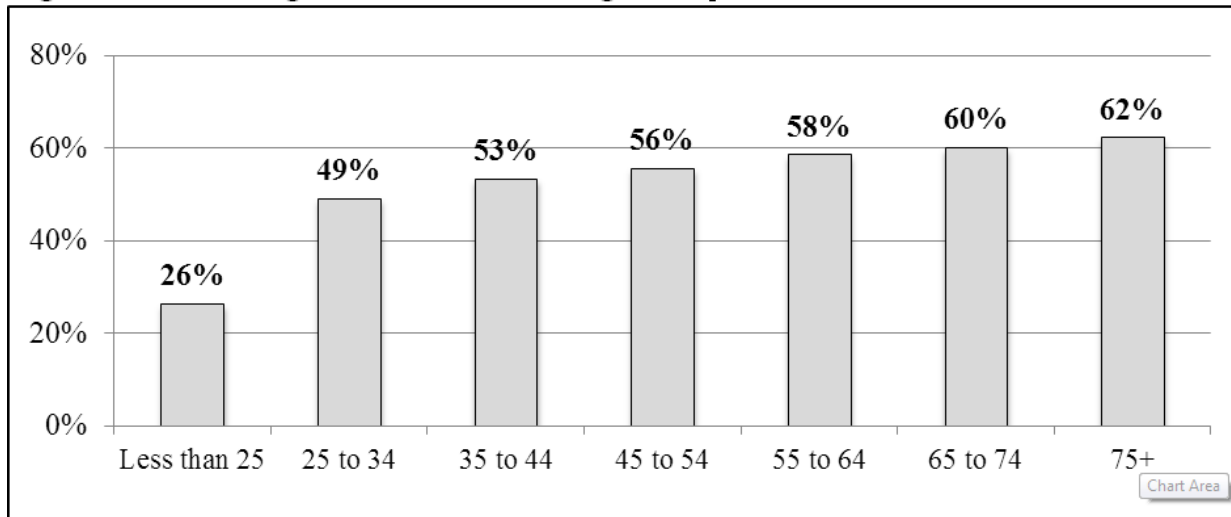
Source: U.S. Census

Estimates of residential property taxes per capita by age are displayed in Figure 24. Younger persons pay less in property taxes both because they are less likely to be heads of household and if they are heads of households, they tend to live in less expensive homes. Property taxes peak at age 45-54 and then decline by about 20 percent by age 75+. The latter pattern reflects both downsizing of homes after children leave and residential property tax reductions that are commonly offered to the elderly and/or those who have lived in their homes for a long time.

Figure 24: Montana Residential Property Taxes by Age
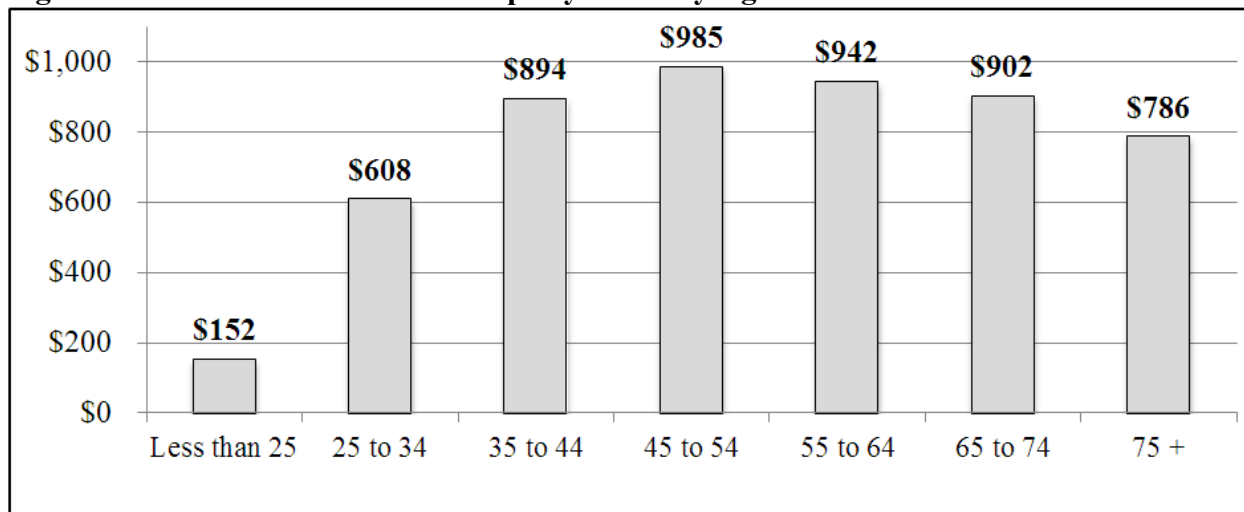
Sources: MDOR, BLS, Year 2010 U.S. Census. Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Figure 25: Residential Property Taxes per Montanan
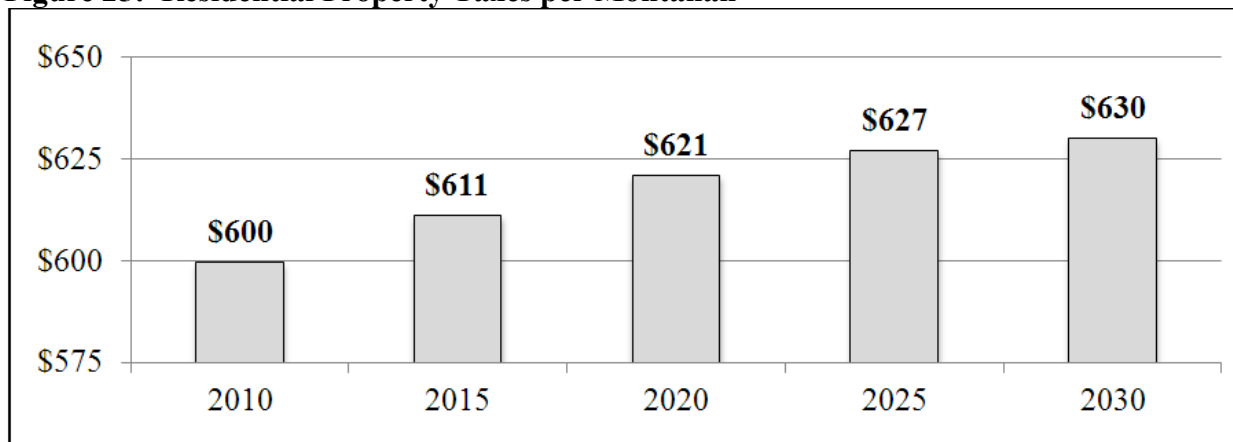
Sources: MDOR, BLS, Year 2010 U.S. Census. Years 2015 to 2030 are estimates using the U.S. Census projections re-weighted with 2010 U.S. Census Data

Individual Resident Income Taxes

Individual income tax liabilities are affected by demographics. Older and younger people usually have lower incomes than middle age people. The demographic influence on income taxes is complicated by a variety of income tax provisions that include tax rate progressivity and tax-exempt status of certain Social Security benefits.

Because Montana resident income tax liability by age is unavailable, calculating the effect of future changing age distribution on income taxes is complicated. However, detailed data are available on the national distribution of income by age.[31] Figure 26 illustrates the relationship between age and family income in the United States.

Mean income refers to the simple average of incomes, while median income refers to the household at the 50th percentile of the distribution. Mean incomes are higher than median incomes, because the distribution of income is "skewed to the right" with relatively few people having very large incomes. The skewness of the distribution is important for projecting income taxes, because those taxpayers with the highest incomes pay most of the income taxes.

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[31] U.S. Census Table H-10 Age of Head of Household by Median and Mean Income
www.census.gov/hhes/www/income/data/historical/household/

The Federal and Montana tax liabilities appear congruent. This means that the Montana income distribution has the same shape (but not necessarily the same average) as the national income distribution. The top national income decile paid 55 percent of the total federal tax liability and the lowest 50 percent paid approximately five percent of the federal tax liability in 2007.[32] In Montana, the top decile also pays 55 percent of all the resident income taxes. Furthermore in Montana the 50 percent of taxpayers with the lowest incomes also pay 5 percent of the total personal income taxes.[33]

Figure 26: National Median and Mean Incomes Based on Age of Householder
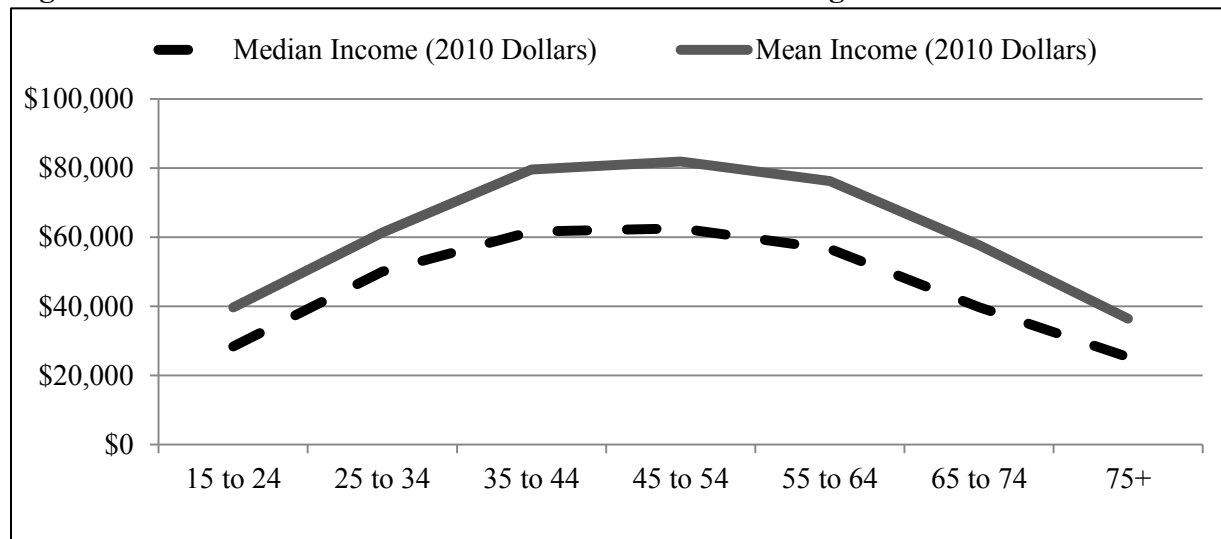
Sources: U.S. Census Table H-10 Age of Head of Household by Median and Mean Income and U.S. Census Bureau

A complete discussion of the method to calculate the income tax liability by age in Montana is included in Appendix D. Developing the tax liability of individuals by age requires both the average income tax liability paid per decile and the percentage of individuals by age group in different income deciles. In brief the distribution of Montanans by age per income decile is developed by scaling the available income by age data available from the U.S. Census

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[32] Congressional Budget Office Tax Liability Shares.
www.cbo.gov/sites/default/files/cbofiles/attachments/Tax_liability_Shares.xls
[33] Montana Department of Revenue, Biennial Report 2008-2010 (p.64)
http://revenue.mt.gov/content/publications/biennial_reports/2008-2010/BiennialReport.pdf

Bureau Current Population Survey (CPS) to the Montana population distribution.[34] An example of the distribution of population and income is shown in Table 11.

Table 11: Estimated Population Age Distribution and Income Tax Liability Fiscal Year 2010

| Decile Group | Income | Proportion of Age Groups in Each Decile | | | | Tax Liability per Taxpayer |
		15 to 24	25 to 44	45 to 64	65 +	
1st (lowest)	Less than $3,148	0.294	0.067	0.062	0.031	$0.00
2nd	$3,148 to $7,822	0.194	0.064	0.065	0.132	$13.00
3rd	$7,823 to $12,723	0.136	0.073	0.075	0.157	$72.00
4th	$12,724 to $17,962	0.110	0.081	0.077	0.166	$187.00
5th	$17,963 to $23,598	0.101	0.097	0.087	0.128	$388.00
6th	$23,599 to $30,407	0.070	0.118	0.100	0.101	$687.00
7th	$30,408 to $38,528	0.048	0.128	0.111	0.085	$1,027.00
8th	$38,529 to $49,302	0.027	0.134	0.124	0.072	$1,465.00
9th	$49,303 to $68,155	0.015	0.127	0.138	0.067	$2,192.00
10th (highest)	Greater than $68,155	0.006	0.111	0.159	0.061	$7,293.00
Per Person Tax Liability by Age		$284.02	$1,555.82	$1,884.36	$949.93	

Source: Authors' calculations, See Appendix D

Table 11 presents the results of determining the taxpayer age and accompanying income decile for that age group. For example, 29.4 percent of the 15 to 24 year olds are in the lowest income decile. The tax liability of individuals in this lowest decile is zero dollars. The Montana Department of Revenue Biennial Report provides the tax liability of each tax payer by income decile. The joint distribution of income and age developed from the CPS was the basis for developing the conditional ratio of being in a decile group based on the age of the taxpayer. An important distinction needs to be made here: these persons are taxpayers. This means that among individuals who file income tax returns the average tax liability is $284.02 for filers of the 15 to 24 age group.

In 2010, according to the Biennial Report, 529,525 returns were filed for the 2009 tax year. The average tax liability per return was $1,332.00. The total tax liability was $705.7 billion. The total tax liability divided by the Montana population for 2009 provides a check to

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[34] CPS Data: www.census.gov/hhes/www/cpstables/032010/perinc/new01_001.htm

determine if the average tax liability per person calculated using the CPS data is accurate. The population of Montana in 2009 was 974,984.[35] Using the biennial report data the average tax liability per person in 2009 was $724. The tax liability per Montanan per year is displayed in Table 12.[36]

Table 12: Estimated Tax Liability per Montanan from 2010 to 2030

Year	Tax Payer Age Group Population Ratios by Year				Tax Liability per Capita
	15 to 24	25 to 44	45 to 64	65 +	
2009	0.180	0.292	0.349	0.177	$724
2010	0.166	0.293	0.358	0.171	$728
2015	0.147	0.296	0.344	0.212	$735
2020	0.139	0.290	0.319	0.252	$723
2025	0.140	0.271	0.301	0.251	$708
2030	0.141	0.247	0.306	0.306	$702

Source: Authors' calculations, See Appendix D

The U.S. Census Bureau projections of population by age group are then applied to the tax liabilities per person shown in the bottom row of Table 11. The results are displayed in Table 12. As shown in Figure 27, the difference in income taxes per Montanan between 2010 and 2030 is a $26 decrease.

Figure 27: Individual Resident Income Tax Liability per Montanan

Source: Authors' calculations, See Appendix D

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[35] http://ceic.mt.gov/Demog/estimate/pop/State/SC-EST2009-01.xls
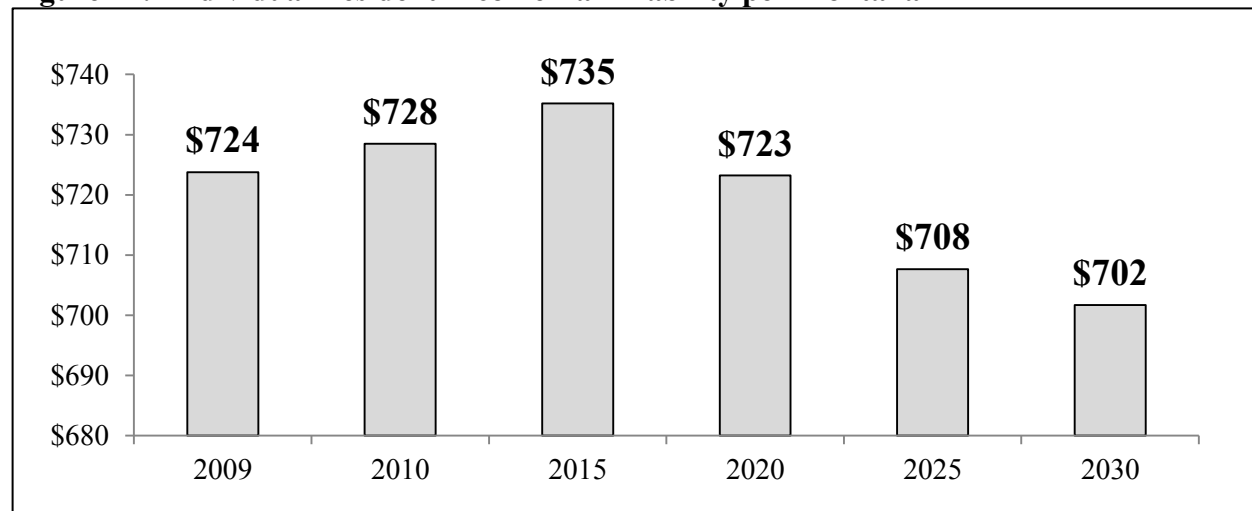
[36] These individual income taxes reported do not include non-resident personal income tax and so are not consistent with the taxes reported in Table 2.

Summary of Ageing Impacts

Table 13 summarizes the impacts of ageing for the expenditure side of the budget.

Between 2010 and 2030, expenditures on K-12 education are projected to decrease by about $86

per Montana resident. Expenditures on higher education are expected to fall by $29 per

Montanan and corrections expenditures by $20. The state's share of Medicaid spending is

projected to increase by $44 per Montanan. Taken all together, expenditures are projected to

decrease by $91 per Montana resident.

Table 13: Summary of Selected Expenditure in Dollars per Montanan

Expenditure	2010	2030	Change	Percent Change
K-12 Education	$1,509	$1,423	-$86	-5.7%
Higher Education	$162	$133	-$29	-18.0%
Corrections	$166	$146	-$20	-12.0%
Medicaid	$206	$250	$44	21.4%
Total	**$2,043**	**$1,952**	**-$91**	**-4.5%**

Table 14 summarizes the results for selected tax revenue. Residential property taxes are

expected to increase $30 per Montanan and income taxes are expected to fall by $26 per

Montanan. The total effect is an increase in tax revenue of $4 per resident.

Table 14: Summary of Selected Tax Revenue in Dollars per Montanan

Revenue	2010	2030	Change	Percent Change
Property Taxes	$600	$630	$30	5.0%
Income Tax Liability	$728	$702	-$26	-3.6%
Total	**$1,328**	**$1,332**	**$4**	**0.3%**

Table 15 combines the projected changes in revenue and expenditure. The impact of the

increase in total tax revenue of $4 combined with decreased expenditure of $91 indicate that

state and local government is moving toward a surplus of $95 per Montanan (which is slightly

over 1 percent of general expenditures).

Table 15: Summary of Selected Tax Revenue and Expenditure in Dollars per Montanan

	2010	2030	Change	Percent Change
Tax Revenue	$1,328	$1,332	$4	0.3%
Expenditure	$2,043	$1,952	-$91	-4.5%

It is worth repeating that these projections hold all factors other than the age distribution constant. Thus, the projections are not forecasts of actual revenue and expenditure, because they will be affected by changes in per capita income, spending per student, health care costs, and other factors. What the projections do tell us is that the impacts of more elderly on Medicaid spending and income tax revenue are offset by less spending on the non-elderly.

FISCAL TRENDS

The expenditure projections presented in the previous section are undoubtedly extremely conservative, because they do not account for any increases in costs per participant or participation rates. The actual changes in expenditures over time depend on both of these factors, in addition to the age distribution. Specifically, spending per Montanan can be written as the product of three factors: Cost per participant, the participation rate of the relevant demographic group, and that group's share of the population. For example, spending per Montanan on K-12 education can be written as:

$$\frac{Spending\,(\$)}{Total\ Population} = \frac{Spending\,(\$)}{Student} * \frac{Students}{Population\ Age\ 5-17} * \frac{Population\ Age\ 5-17}{Total\ Population}$$

The expenditure projections in the previous sections vary only the last term – the proportion of the population that is of school age – while holding constant the other two terms on the right hand side – spending per student and the proportion of the age group that participates. Because the school age population is expected to decline as a proportion of the total population, we project declining expenditures per Montanan on K-12 education. But as historical data illustrates, spending per student and the participation rate may not stay constant.

Changes in cost per participant and participation rates over the last 40 years have had powerful impacts on spending per Montanan, in addition to the changing age distribution. Table 16 displays the *actual* growth rates in selected general expenditures per Montanan since 1970, adjusted for inflation.[37] Spending on K-12 education increased an average of 1.1 percent per year over 39 years. As discussed in the section on K-12 expenditures, spending per student increased an average of 2.3 percent per year. Spending per Montanan increased more slowly than

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[37] Growth rates are computed from Bureau of the Census data reported in the "Government Finances" series – the same source as for the data in Table 2.

spending per student, because the last term produced a favorable "demographic dividend:" The ratio of school age population to total population declined as the baby boom generation moved out of school and into the work force. School enrollment actually declined 19 percent while the total population increased 42 percent, so schooling costs for a smaller cohort of students were spread over a larger total population.[38]

Table 16: State and Local Government General Expenditures (Annual Percentage Increase Per Montanan in Constant 2008-2009 Dollars)

	Annual Percentage Increase				
	1969-70 to 1979-80	1979-80 to 1989-90	1989-90 to 1999-00	1999-00 to 2008-09	1969-70 to 2008-09
K-12 Schools	3.3%	-0.1%	-0.1%	1.1%	1.1%
Higher Education	-1.1%	0.8%	5.7%	2.3%	1.9%
Corrections	NA	-1.0%	9.3%	2.9%	3.8%
Social Services	3.9%	3.6%	3.2%	2.6%	3.4%
Total	2.5%	0.8%	1.9%	1.8%	1.8%

Notes:
Higher Education includes teaching, research and Auxiliary Operations (Dormitories, Food Service)
Corrections Expenditure is not available in 1969-70. Growth rate in the last column is since 1979-80.
Social Services include Public Welfare, Health and Hospitals
General Expenditures exclude Utilities, Liquor Stores, and Insurance Trusts. See Table 2

The demographic dividend over the next 20 years is expected to be much smaller – reducing spending per Montanan by less than 6 percent. If spending per student continues to increase at the historical rate of 2.3 percent per year and participation rates are unchanged, spending per Montanan will increase from $1,509 in 2010 to $2,242 in 2030.

Historical data on just the instructional portion of higher education expenditures are not available prior to the mid-1990s. Thus, the data in Table 16 going back to 1970 include not just instruction but also research, extension, and auxiliary operations (dormitories and food service), whether financed by state support, tuition, grants and contracts or other sources. Total expenditures per Montanan on higher education increased an average of 1.9 percent per year

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[38] School enrollment based on average daily attendance in public elementary and secondary schools from the Digest of Educational Statistics (2011) Table 42. http://nces.ed.gov/programs/digest/d11/tables/dt11_042.asp

since 1970. The increase results in part from both higher spending per student and higher participation rates.[39] In addition, increases in grant-funded research and auxiliary operations have contributed to the overall growth in higher education spending. As indicated previously, the available data show no trend in state instructional funding per student (after adjustment for inflation) over the last 15 years. Increases in spending have been financed mainly by increased tuition and fees, charges for auxiliary operations, and grants and contracts.

Correctional expenditure also increased rapidly, averaging 3.8 percent per year since Fiscal Year 1989-90 on top of inflation and population growth.[40] Increased spending was driven primarily by increased participation rates, i.e. increased proportions of the population behind bars or otherwise involved with the correctional system. U.S. national data show that the number of adults in the correctional system increased from 1.84 million in 1980 to 7.23 million in 2009, or from 0.81 percent of the total U.S. population to 2.35 percent.[41] In other words, the participation rate increased an average of 3.7 percent per year. In contrast the growth in cost per participant was relatively modest – about 0.5 percent per year faster than the rate of CPI inflation. Future corrections expenditures will depend heavily on trends in both per unit costs and incarceration (participation) rates.

Spending on social services (public welfare, health, and hospitals) almost quadrupled since 1970 with an average annual growth rate of 3.4 percent per year in addition to inflation and population growth. As discussed previously, Medicaid expenditures per enrollee have increased an average of 2.5 percent per year faster than inflation since 1985. In addition, participation rates have increased as eligibility for Medicaid and other services has been expanded. In

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[39] Nationally, the percentage of 18-24 year old high school graduates enrolled in institutions of higher education increased from 32.6 percent in 1970 to 48.8 in 2009. Digest of Educational Statistics (2011), Table 213. http://nces.ed.gov/programs/digest/d11/tables/dt11_213.asp
[40] Corrections expenditure is not available separately for fiscal year 1969-1970.
[41]Long term data are not immediately available for Montana. The adult correctional systems include those on probation or parole and those incarcerated in state or federal prisons or local jails. U.S. Department of Justice, "Correctional Population in the United States, 2010," http://bjs.ojp.usdoj.gov/content/pub/pdf/cpus10.pdf

national data, the Medicaid participation rate doubled from 8.7 percent of the population in 1980 to 17.5 percent in 2010.[42] The direction of the "demographic dividend" is unclear without more research. The increasing elderly dependency ratio tended to increase expenditures per Montanan while the decreasing youth dependency ratio tended to decrease expenditures per Montanan.

Table 17 illustrates how projections of future spending on selected services are affected by incorporating historical trends in costs per participant. The column labeled "2010" shows the baseline spending per Montanan. The Higher Education entry reflects only the costs to Montana taxpayers for instruction, and the Medicaid entry reflects only Montana's share of the total cost of the Medicaid program. The column labeled "Without Cost Trend" shows the projected spending taking account of only changes in the age distribution. The next column shows the historical trend of increases in cost per participant, and the last column shows the projected expenditures in 2030 if costs per participant continue to increase at historical rates. It is evident that trends in cost per participant have important implications for future spending, usually implying greater impacts than changes in the age distribution itself. Combining the effects of ageing and historical trends in cost per participant, total expenditure per Montanan on these services would increase 1.8 percent per year faster than inflation.

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[42] Centers for Medicare and Medicaid Services, Data Compendium (2011 Edition), Table I.3
www.cms.gov/Research-Statistics-Data-and-Systems/Statistics-Trends-and-Reports/DataCompendium/2011_Data_Compendium.html

Table 17: Projected Expenditures Without and With Cost Trends (Per Montanan in Constant 2008-2009 Dollars)

	2010	Projected 2030		
		Without Cost Trend	**Historical Trend (%/year)**	**With Cost Trend**
K-12 Education	$1,509	$1,423	2.3	$2,242
Higher Education	$162	$133	0.0	$133
Corrections (2012 base)	$166	$146	0.5	$160
Medicaid	$206	$250	2.5	$410
Total	**$2,043**	**$1,952**	**2.1**	**$2,945**

Future participation rates will also influence expenditures. Higher education expenditures will depend on whether the historical trend toward higher enrollment rates continues; corrections expenditures will depend on whether the historical trend toward incarcerating more people continues; and Medicaid expenditures will depend on whether eligibility rules and economic conditions encourage higher or lower enrollment. Montana's Medicaid expenditures will also be strongly influenced by what happens to the state's share of total Medicaid spending.

As the last row of Table 16 indicates, total state and local government general expenditures per Montanan – including all General Expenditures listed in Table 2 – approximately doubled since 1970, increasing 1.8 percent per year faster than inflation. Personal income per Montanan increased 1.4 percent per year faster than inflation during this time period. Consequently, General Expenditure grew from 19.5 percent of personal income to 22 percent (Figure 28). Expenditure on local schools decreased from 5.4 percent of personal income to 4.7 percent. Higher education expenditure on teaching, research, auxiliary operations, etc. increased from 2.0 percent to 2.4 percent. Social services accounted for most of the growth in expenditure, more than doubling from 2.2 percent of personal income to 4.7 percent. All other general expenditure (including corrections) increased from 9.8 percent of personal income to 10.1 percent.

Figure 28: State and Local General Expenditure as a Percent of Montana Personal Income
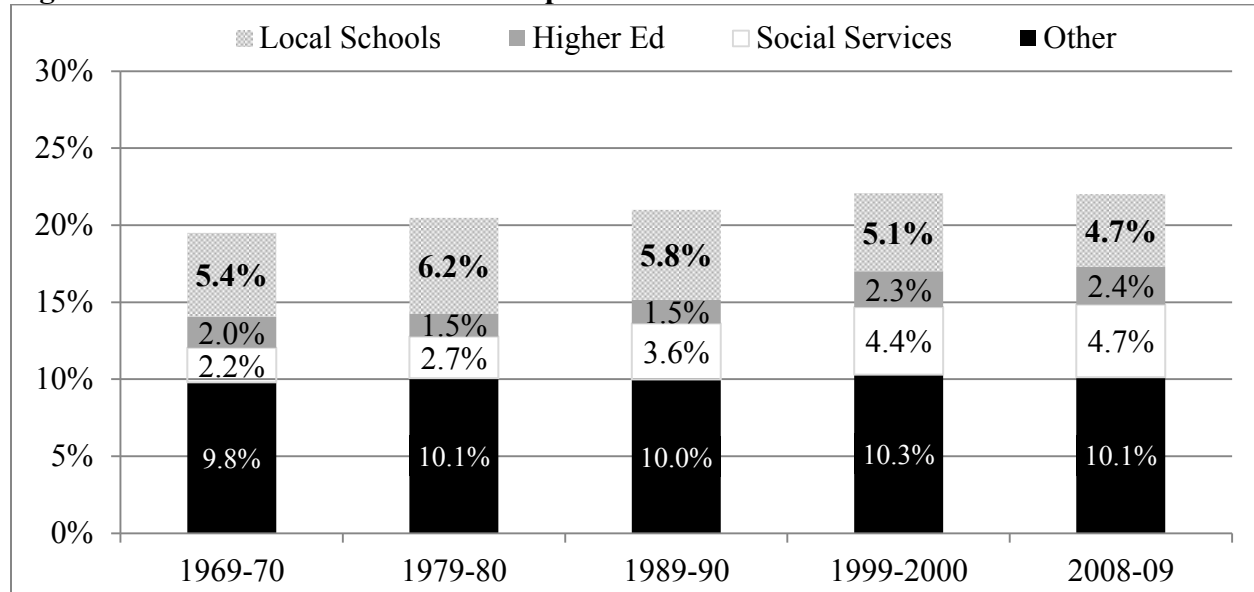
Source: Bureau of Census

How were these spending increases financed? As Table 18 indicates, intergovernmental transfers from the Federal government, state and local taxes, and charges and miscellaneous revenue each increased between $1,300 and $1,500 per person since 1970. The growth in charges and miscellaneous revenue was the largest in percentage terms, followed by transfers and then taxes.

Table 18: State and Local Government General Revenue (Per Montanan in Constant 2008-2009 Dollars)

	Year				
	1969-1970	1979-1980	1989-1990	1999-2000	2008-2009
Federal Gov't.	$997	$1,525	$1,319	$1,840	$2,373
Taxes	$2,261	$2,766	$2,852	$3,003	$3,558
Charges/Misc.	$617	$985	$1,546	$1,999	$2,094
Total	$3,847	$5,182	$5,681	$6,808	$8,026
	Annual % Increase				
	1969-70 to 1979-80	1979-80 to 1989-90	1989-90 to 1999-00	1999-00 to 2008-09	1969-70 to 2008-09
Federal Gov't.	4.3%	-1.4%	3.4%	2.9%	2.2%
Taxes	2.0%	0.3%	0.5%	1.9%	1.2%
Charges/Misc.	4.8%	4.6%	2.6%	0.5%	3.2%
Total	3.0%	0.9%	1.8%	1.8%	1.9%

Notes: General Revenue exclude Utilities, Liquor Stores and Insurance Trusts
Source: Bureau of the Census

Figure 29 displays the revenue sources measured as a percent of Montana personal income. Since the growth in revenue exceeded the growth in income, total revenue increased as a percentage of personal income, from 19.7 percent to 23.2 percent. State and local taxes declined as a percentage of personal income, from 11.5 percent to 10.3 percent. Charges and miscellaneous revenue almost doubled from 3.1 percent of personal income to 6.1 percent. Federal government transfers to state and local governments increased from 5.1 percent of personal income in fiscal year 1969-70 to 6.9 percent in 2008-09. In the early 1970s, these transfers were largely for highways - in particular for completion of the interstate highway system. Montana continues to receive substantial monies for roads, but the largest portion is now for human services – programs like Medicaid – and also for education and other programs. The challenges of balancing the Federal government budget raise concerns about whether transfers will continue to increase – or even maintain current values.

Figure 29: State and Local General Revenues as a Percent of Montana Personal Income
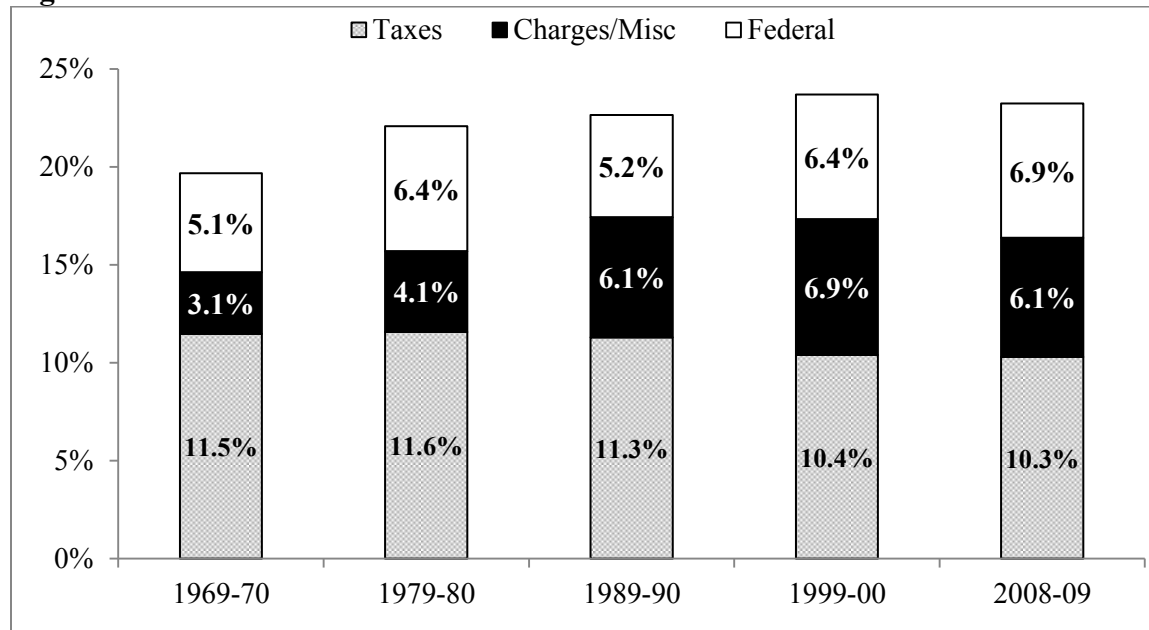
Source: Bureau of Census

SUMMARY AND CONCLUSION

Montana's working age population will decline in the next two decades, because the "Baby Boom" generation is reaching retirement age and because young adults continue to migrate out of Montanan. Consequently, the elderly dependency ratio will double by 2030. Ageing will occur most rapidly in many of the rural areas of Eastern and Northern Montana; ageing will occur least rapidly in the more urbanized areas and on Native American reservations.

Changing demographics will affect state and local government budgets in a variety of ways. This report considers some of the fiscal impacts. The main part of our analysis focuses on changes in the age distribution by holding all other factors constant: expenditure per student, per capita incomes, tax rates, Federal funding and so forth.

Ageing alone will have relatively modest impacts on the combined budgets of state and local governments. While expenditures on the elderly for Medicaid and other services will rise, they will be offset by lower educational and correctional costs. And while ageing may reduce income tax revenues, these declines are likely to be offset by increased residential property taxes.

However, relatively small impacts on combined state and local budgets may conceal substantial changes by level of government and region of the state. For example, most of the rising expenditures on the elderly are paid from state as opposed to local funds, while a substantial fraction of K-12 education is paid for at the local level. Similarly, migration of young people out the rural areas of the state may increase taxable values per student while lowering them in more urbanized areas.

In addition, greater fiscal challenges may emerge from trends in education and health care costs, potential decreases in Federal funding, and slower income growth. K-12 education expenditures per student and Medicaid expenditures per participant have increased faster than

general inflation and income. Currently, the Federal government pays two-thirds of Medicaid expenditures, but pressure on Federal budgets may result in significant decreases. In addition, policy changes at both the Federal and state levels may affect participation in and costs of Medicaid. Cuts in Federal funding could also affect highways and education.

In addition to Federal dollars, state and local governments have increasingly relied on charges and fees, which have doubled as a percentage of personal income over the last four decades. Given that the largest single recipient is higher education, significant decreases in Federal funds for research, instruction, and outreach may result in reductions in activity and/or further increases in charges and fees at higher education institutions. In contrast, state and local taxes have decreased as a percentage of income. Further decreases in taxes in combination with increasing costs for education, corrections, and social services would create a fiscally unsustainable situation.

The next two decades are likely to be significantly different than the last four, because there will be a smaller "demographic dividend." On the expenditure side, the impacts of increases in per student spending in K-12 over the last four decades were ameliorated by a reduced number of students and a larger working age population to pay the bills. But in the next two decades, changes in the school age population will have a much more modest impact on expenditures. On the income side, growth in per capita income over the last four decades has been swelled by the movement of the Baby Boom generation into the workforce and, eventually, into their peak earning years. Substantial increases in women's labor force participation also helped to raise per capita incomes. But in the next two decades, the Baby Boomers will retire and women's labor force participation rates are not expected to rise. Thus, increases in state and local government spending over the last four decades have been mostly offset by increases in ability to pay as measured by personal income. But over the next two decades, income growth

may slow and the "demographic dividend" shrink, making continuing increases in expenditures per Montanan much more difficult to digest.

Future efforts could improve this study in a number of ways. Rather than rely on national data, Montana data on income taxes and residential property taxes could be utilized. An inventory could be compiled of other age-related revenue and expenditure. A closer proxy for estimating net future surplus or possible deficit would incorporate trends in income, consumption, and costs. For example, increases in per capita income will increase tax revenue, but they are also likely to increase costs for teachers, health care workers, and others. Additional regional breakdowns could be performed, especially with regard to school-age populations.

APPENDIX A:

Population Projections

At the state level, population estimates used are the Interim State Projections of Population for Five-Year Age Groups and Selected Age Groups by Sex: July, 1 2004 to 2030 from the U.S. Census released in 2005. At the county level, the estimates used are from NPA Data Services, Inc. released in 2008. To provide increased accuracy, the numbers in both data sets are readjusted with 2010 Census figures in the following way. The percentage change for each 5 year increment from 2010 to 2030 is calculated with the original Census and NPA projections. The 2010 estimates for both data sets were then replaced with actual 2010 Census figures. The percentage change calculated with the original projections was then applied to the actual Census 2010 figures. In essence, the population changes that NPA and the U.S. Census had calculated for each year are still inherent in the data, but the baseline data has been changed from 2005 for Census and 2008 for NPA to the actual 2010 population for both. Using more recent data, especially Census data, provides for increased accuracy and reliability.

APPENDIX B:

Medicaid Cost Inflation

According to the Congressional Budget Office (CB), "Excess Cost Growth in Health Care" is one of the most significant threats to Federal as well as State and Local Government budgets.[43] Consequently, the CBO has devoted considerable resources to carefully measuring the rate of increase in health care costs per beneficiary in Medicaid, Medicare, other government programs and in the overall economy, each adjusted for changes in the demographic composition of the beneficiaries (participants). Similarly this study considers increases in unit costs, particularly in the Fiscal Trends section. However, this study uses a different measure of cost inflation than that used by the CBO. This appendix explains the relationship between the two.

This study considers the rate of increase of cost per participant in excess of general inflation, as measured by the Consumer Price Index (CPI). For example, we calculate how much faster spending per student in K-12 education increased than the CPI, expressed as a percent per year. The CBO's concept as applied to health care inflation is how much faster spending per beneficiary increased than the rate of growth of nominal income per person. The rate of growth of nominal income per person is the sum of the rate of general inflation plus the rate of growth of real income per person. Thus, the measure of cost growth in this study is higher than the CBO's measure by the rate of growth of real income per person.

A few other technical details make the calculations slightly more complicated. The CBO's concept of income per person is potential – rather than actual – GDP per person. The CBO provides estimates of real potential GDP.[44] We then compute real potential GDP per

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[43] Congressional Budget Office, "Long Term Budget Outlook, 2012," p. 53
www.cbo.gov/sites/default/files/cbofiles/attachments/06-05-Long-Term_Budget_Outlook.pdf
[44] CBO, "Key Assumptions in Projecting Potential GDP", August 2012 www.cbo.gov/publication/43541

person by dividing by U.S. population.[45] The growth rate of nominal potential GDP per person is the sum of the growth rates of real potential GDP per person and the GDP deflator.[46]

Thus, the measure of Medicaid cost increases in excess of general (CPI) inflation used in this study is equal to: CBO Medicaid Excess Cost Growth + Real Potential GDP per person Growth + GDP Deflator Growth − CPI Growth.[47]

[45] Bureau of the Census, "Statistical Abstract of the United States, 2012", Tables 1 and 2
[46] Bureau of Economic Analysis, www.bea.gov/iTable/iTable.cfm?ReqID=9&step=1
[47] Further detail is available upon request. Ask for file "Excess Cost Growth" in the folder "Trends."
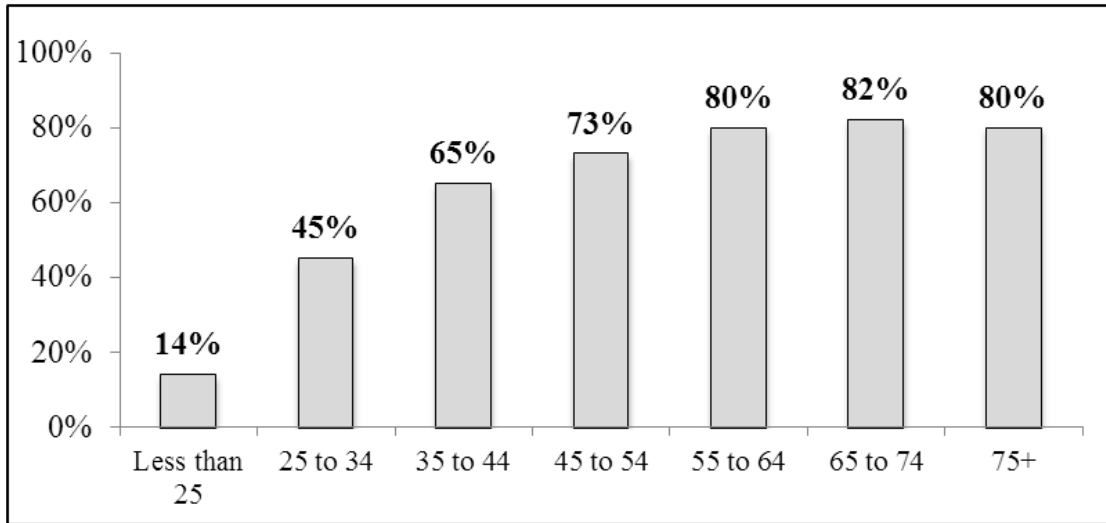
APPENDIX C:

Estimating Residential Property Taxes

There are several significant problems in estimating residential property taxes. First, tax data by age are not available specifically for the state of Montana. Consequently, national data from the Bureau of Labor Statistics (BLS) are used instead and the results are scaled to Montana totals (Figure 30).[48] Secondly, the BLS tax data report residential property taxes only for homeowners, ignoring the taxes that are paid by landlords on behalf of renters. However, "rents" are available for both renters and homeowners, where the latter are the "estimated monthly rental value of owned home". The ratio of rents reported by renters to these estimated rents of homeowners averages about 0.5. In other words, if the average homeowner were to rent his house, it would rent for twice the rent paid by the average renter. Property taxes for renters are estimated by multiplying the property taxes of homeowners by the rent ratio mentioned above. Average property taxes for all individuals in an age group are a weighted average of renter and owner property taxes, with the weights varying by age according to the probabilities of household headship and homeownership.

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[48] U.S. Bureau of Labor Statistics Consumer Expenditure Survey, 2010, Table 3. Age of reference person: Average annual expenditure and characteristics www.bls.gov/cex/2010/Standard/age.xls

Figure 30: Percentage of Montana Population that are Homeowners

Source: U.S. Bureau of Labor Statistics Consumer Expenditure Survey, 2010, Table 3. Age of reference person: Average annual expenditure and characteristics

APPENDIX D:

Estimating Individual Income Tax Liabilities

The method for calculating the individual resident tax liability per person is founded on two assumptions. The first is that the tax liability for each income decile remains constant over time. The second is that the population distribution of income deciles for Montanans is the same as the United States. That is to say, even though Montanan's incomes are generally 80 percent of the National average, the distribution (or proportion) of individuals that fall within each income decile is the same. This proportion is the critical measure for determining tax liability.

To determine the incomes of individuals by age, the Current Population Survey (CPS) *Annual Social and Economic (ASEC) Supplement PINC-01, Selected Characteristics of People 15 Years Old and Over by Total Money Income in 2009, Work Experience in 2009, Race, Hispanic Origin, and Sex* was used.[49] This survey collected data on 242,168,000 individuals and grouped them by annual income level within demographic profiles. Of this total count 211,254,000 individuals are reported as having income or a loss. Those individuals that did not have income (or a loss) were not included in the calculation because it was assumed these persons are not filling an income tax return. Only the count of individuals by age within each income category was used. It was assumed that the demographics of race, gender and education were congruent with the aggregate distribution in Montana.

To adjust for the difference in age composition between the National CPS sample data and Montana, an unconditional ratio table was constructed adjusting for Montana using the 2009 U.S. Census Montana population data and the 2009 U.S. Census National population data.[50]

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[49] CPS Data: www.census.gov/hhes/www/cpstables/032010/perinc/new01_001.htm
[50] http://ceic.mt.gov/Demog/estimate/pop/State/SC-EST2009-01.xls

The population of Montana and U.S. persons were divided and totaled into relevant age groups, 15 to 24, 25 to 44, 45 to 64, and 65+. The annual income brackets begin with, $1 to $2,500 (or loss) and progress in $2,499 increments to $100,000 and greater. The proportion of individuals within each age group and income range, P(·), was calculated:

$$P(Xm \text{ and } Ys) = P(Xs \text{ and } Ys) * \frac{P(Xu)}{P(Xs)} * \frac{P(Xm)}{P(Xu)}$$

Where; s = survey, u = U.S., m = MT, Y = income, X = population

Table 19: Proportion of Montanans Age 15 and Older by Income and Age Category in 2009

Age Group	$1 to $2,499	$7,500 to $9,999	$25,000 to $27,499	$50,000 to $52,499	$62,500 to $64,999	$70,000 to $72,499	Marginal Probabilities
P(15 to 24)	0.023	0.010	0.004	0.001	0.000	0.000	0.116
P(25 to 44)	0.014	0.011	0.016	0.011	0.002	0.006	0.308
P(45 to 64)	0.017	0.017	0.016	0.014	0.003	0.007	0.382
P(65+)	0.003	0.02	0.008	0.004	0.001	0.001	0.198
Sum							**1.004**

Source: Bureau of Census

Determining the total proportion of individuals in each income decile was a matter of summing the proportions of each age group across income levels using an iterative method.

$$0.1 = \sum_{y=1}^{Ys} P(Xm_{n,ys}) + \frac{P(Xm_{\text{interval}})}{\$2,500} * Ys$$

Where; n = 15 to 24, 25 to 44, 45 to 64, 65 + age groups

To account for the fraction of the decile population that falls within an income interval a linear interpolation, $\frac{P(Xm_{\text{interval}})}{\$2,500}$, was used. The resulting deciles each contain 10 percent of individuals. Each decile has a different distribution from each age group. As would be expected, the majority of the 15 to 24 age group are in the lower deciles. Table 20 presents these results.

The individual income tax liability information for the Montana income deciles was gathered from the Montana Department of Revenue Biennial Report, July 1, 2008 to June 30, 2010.[51] The Taxable Income and Tax Full Year Residents 2008 and 2009 table (p.64) listed the average annual tax liability for each income decile.

Table 20: Proportion of Age Groups in Each Income Decile

Age Group	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
P(15 to 24)	0.053	0.035	0.025	0.020	0.018	0.012	0.009	0.005	0.003	0.001
P(25 to 44)	0.020	0.019	0.021	0.023	0.028	0.034	0.037	0.039	0.037	0.032
P(45 to 64)	0.022	0.023	0.026	0.027	0.030	0.035	0.039	0.043	0.048	0.056
P(65+)	0.005	0.023	0.028	0.030	0.023	0.018	0.015	0.013	0.012	0.011
Total	**0.10**	**0.10**	**0.10**	**0.10**	**0.099**	**0.099**	**0.10**	**0.10**	**0.10**	**0.10**

Average tax liability by age is the conditional proportion of individuals from each age group falling into the 10 different deciles. Determine the proportion of each age group in each decile by:

$$DA_i = \frac{P(d\ A_n)}{\sum (P(A_n))}$$

Where; d_i = decile with $i = 1 \ldots$ and

Where; age with $n = 15$ to 24, 25 to 44, 45 to 64, 65+ age groups

Each age group has a different tax liability. From the least tax liability to the greatest are the 15 to 24, 65+, 25 to 44, and 45 to 64 age groups. The 0 to 14 age group is omitted because these individuals were not observed in the CPS data and their tax liability is de minimis. The per tax payer tax liability by age is:

$$TL_n = \sum_{i=1}^{10} DA_i * T_i$$

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[51] 2008-2010 Biennial Report http://revenue.mt.gov/content/publications/biennial_reports/2008-2010/BiennialReport.pdf

Where; T_i = the tax liability per tax payer in each decile i

Transitioning from the average tax liability per taxpayer age group requires adjusting the

$$TPC_y = r * \sum_{n=1}^{4} \left(P(A_n) y \right) * TL_{ny}$$

Where; y = the tax liability year

$$r = \frac{R}{Xm}, \ R = total \ number \ of \ returns$$

The variable, r, is assumed constant in developing the projections. The constant, r, for the fiscal year 2010 was 0.543.