Mapping Demographic Trends for School Enrollment Projection in the Independent School District 709 (Duluth, MN)

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Executive Summary

This study was a mapping project directed at providing the ISD 709 of Duluth, MN with accurate maps depicting demographic trends in school attendance areas as well as census blocks and tracks. It was conceptualized as a comprehensive planning tool for the school district, the school board, community members and concerned parents, and provides information about demographic trends from the year 2000 to 2014. The demographic analysis was centered on mapping the number of children between the ages of 5 and 17 for each census block, track and school attendance area in Duluth. In addition, it provides data about the current population over the age of 60, and thus enables planners to detect areas with the highest upcoming turnover in the future housing market. The analysis was based entirely on Census 2000 data, and does not in any way reflect actual school enrollment, but rather projects school enrollment as a function of overall population trends. The following current demographic trends can be observed in the ISD 709 of Duluth:

1. Over the next ten years, the school district as a whole will lose potential student population.
2. The overall losses and gains of students for individual attendance areas of elementary, middle, and high schools range between a 32% loss and a 30% gain of student population per attendance area. While most attendance areas in the school district are losing population, there are some growth areas that need to be considered.
3. For elementary school attendance areas, Homecroft, Piedmont and Lakewood will experience the strongest losses, while Grant and Nettleton will see gains of potential student population between 2000 and 2005.
4. For middle school attendance areas, all attendance areas will see losses in population between 2000 and 2011. The strongest losses will occur in the Ordean attendance area, while Morgan Park will only see relatively small changes of -5% over 11 years.
5. For high school attendance areas, net losses of student population will be between 32% (East High School) and -10% (Denfeld High School) from 2000 to 2014.
6. Using the population over Age 60 as an indicator for future total turnover of property ownership and the potential influx of young families with children, both the maps of census tracts and block reveal the highest concentration of seniors on the central hillside. The turnover of property ownership and the influx of younger families and school-aged children will most likely be highest in these areas. The blocks and tracts with the highest population over age 60 fall into the attendance areas for Lowell, Chester Park and Piedmont Elementary Schools, Woodland Middle School and Central High School.
7. The trends depicted here assume that student population in each attendance area does actually attend a school in the given area. They cannot account for students who reside in one area, but attend school in another. Also, no conclusion can be drawn about the numbers of students attending private or charter schools, or schools outside of school district 709.
Introduction

Background

School districts in the United States have long been dependent on monitoring their enrollment figures in order to manage and allocate financial resources (Smith 1952, Fabricant and Weinmann 1972, Folger, 1974, Stronge and Schultz 1981). Declining or increasing enrollment, as well as changing federal and state support can have a profound effect on the resources available in schools. Historically, school enrollment figures have been tied to national, state and local economic growth or decline (Peaslee 1967). In addition, demographic trends influenced the total student population of the United States (Schroeder 1996). Increasingly, researchers have also addressed the growing alternatives to public schools (charter, private and religious schools) and the issue of school vouchers and parental choice in analyzing public school enrollment projections (Smith and Meier 1995, Zehr 2004). Such increased interest in the links between demographics, economic patterns and school enrollment can also be observed in the Independent School District #709 in Duluth, Minnesota.

Justification of the Study

Budgetary concerns, stagnant population development and increased competition from charter and private schools have made accurate enrollment projection a key strategy in managing the successful and economically sound operation of Duluth’s public schools. While the school district routinely conducts demographic assessments and enrollment projections for each of its elementary, middle and high schools to make decisions about the needs and necessity of each school, little information about other demographic factors
influencing these changing projections has been available until recently. Beyond
traditional enrollment data projection (based on actual enrollment numbers), the school
district would profit in its projection goals from a wider range of population data such as
census data, population growth projections on the county and sub-county level, and
adequate interpretive data based on these numbers. While this data is available and
reliable, it has been underutilized by the school district.

*Study Goals and Objectives: Supporting Community Research Needs*

As a consequence of this interest by ISD #709, then-superintendent Julio Almanza
contacted the Center for Community and Regional Research at the University of
Minnesota-Duluth in Spring 2003, and requested information about a possible research
cooperation between the Duluth school system and researchers at the university.
Lawrence Knopp, director of CCRR and professor of geography at UMD, arranged a
meeting with Almanza and recommended Olaf Kuhlke, assistant professor in the
Department of Geography as a principle investigator for future cooperation between these
two organizations. Upon approval of the cooperative grant proposal in March 2003,
Kuhlke and two student researchers collected, analyzed and mapped out US Census data
to provide data support for the school district’s long range enrollment planning strategies.

The purpose of this research was to assist the school district in accessing a wider
range of social and geographic data that is beneficial for the assessment of future
enrollment. This project sought to create a digital as well as manual easy-to-use data
storehouse, map collection, and demographic analysis tool on the basis of Census 2000
data. Three steps were involved in the completion of this project.
1. Data gathering: In the first phase of the project, participants gathered demographic and school enrollment data on a number of spatial scales from several public sources, and integrated these into a relational data base. Sources included Census 2000 data for St. Louis and surrounding counties, demographic data for the Arrowhead region, ISD# 709 enrollment data, and numerous other sources. Additionally, a series of base maps in vector format were created and compiled that assisted in the display of the data.

2. Data analysis: In the second phase, the existing enrollment analysis done by the school district was compared to Census 2000 demographic data on the census tract and block level, using a regression model. The resulting maps are displayed in this report and are supplemented with a detailed interpretation.

3. Data Display: As a final step, the project report and maps were made publicly available on a project website located at http://www.d.umn.edu/~okuhlke/projects

Student Involvement

As required by CCRR guidelines, its funded projects must involve community-based research cooperation with a local organization, and give UMD students the opportunity to actively participate in sponsored projects. For this project, two students were hired throughout the duration of the project from Summer 2003 to Summer 2005. The involvement gave the student in-depth experience in data collection and organization, record keeping, data management and quality control. The students’ responsibilities included collection and processing of school enrollment and demographic
data, the creation of printable digital maps and map overlays based on this data, assistance in the spatial and interpretive analysis involved in demographic forecasting and support in the creation of a digital map display. This allowed the students to fully understand the research process from start to finish. In addition, the students were required to assist in the writing of the final project report. This report in its final format has been delivered to the ISD# 709 School Board and superintendent’s office, and the Center for Community and Regional Research at UMD.

Evaluation of the Cooperation between ISD# 709 and the University

As stated above, the project was originally initiated by the superintendent of ISD# 709, Julio Almanza. Following the approval of funds by CCRR, the principle investigator for this project, Dr. Olaf Kuhlke, met Almanza several times to develop a “data wish list” for the school district that clearly stated the demographic mapping needs of the superintendent’s office in regards to long range community planning. While ISD#709 already had their own enrollment data and projections scenarios (that it shared with the research staff for the purpose of this project), specific interests of further data exploration lay in the analysis of Census data for determining future potential enrollment trends. Typically, ISD#709 has been conducting its own predictions of the enrollment figures for each elementary, middle and high school, based on the actual enrollment of students in each attendance area. In addition, the school district had already obtained a map of census data, portraying the population of children under the age of 18 for each Census tract within its boundaries.
In the course of further cooperative development, the project staff determined the following needs of the superintendent’s office regarding additional data:

1. In order to predict future potential enrollment in Duluth Schools, it is necessary to look beyond school enrollment data alone. School enrollment depends upon population development and turnover rates in neighborhoods, and reflects economic as well as social trends.

2. Future population development that can influence school enrollment is best predicted by using reliable population data, such as is issued by the US Census Bureau. Thus, this study involved the acquisition and analysis of census data for the area of ISD# 709.

3. While the school district already had a map depicting the number of children under the age of 18 per Census tract for the area of ISD# 709, no mapped data about the number of children in specific age groups was yet available. In addition, no data had been acquired that could predict population development on a much more refined geographic scale – the block level. Subsequently, this project set out to create maps that provided two sets of mapped data: First, it produced maps showing the number of children of typical elementary, middle and high school age. Based on the average age of students, the project mapped the number of 5-10 year-olds, 11-13 year-olds and 14-17 year-olds for each Census tract and block. This analysis was done with Census 200 data. In addition, for each of these age groups, statistical projections were created that allowed the mapping of the
population numbers for these groups for the years 2005 (5-10 year-olds), 2011 (11-13 year-olds) and 2014 (14-17 year-olds).

4. The school district expressed interest in maps that show the Census 2000 data, broken up in tracts and blocks, for each elementary, middle and high school attendance area. In this way, it would be possible to map out where in the attendance area the largest number of current potential students live. Also, it was requested to project these number of current potential students into the future as far as was statistically reliable. Thus, a series of maps was created that mapped the number of potential students for each elementary, middle and high school and projected them into the future (2005 for each elementary school, 2011 for each middle school, and 2014 for each high school). It is important to note here that what was mapped were *not* actual enrollment figures. For each attendance area, on the census block level, the number of children of a certain typical school age was mapped. For example, for each elementary school attendance area, the number of children of K-5 age (determined as 5-10 years of age, on average) was displayed on the census block level. These numbers were then projected into the future with the help of a regression model. This means that this project mapped the number of potential students that could attend school in each attendance area, both in 2000 and in the future. The project by no means intended to project actual enrollment (this has already been done by the school district itself). Census data thus provides only a measure of potential, but never the actual future enrollment numbers. Accurate future projections of actual enrollment are difficult to obtain due to the fact that not all children within an attendance area do actually attend
the school they are assigned to – they might choose a charter or private school instead, or go to a school outside of their attendance area.

5. To portray and summarize the detailed numbers and trends outlined in the map products above, the school district requested statistical tables and maps that summarize future potential enrollment trends. This information comprised another set of maps produced for this project.

6. Finally, the school district and the City of Duluth have expressed a strong interest in areas of potential population turnover in Duluth. Potential population turnover primarily occurs in areas where a large number of elderly people are located. Over time, these individuals either move away from Duluth due to retirement, or they pass away. The housing units then vacated are, at least in theory, available on the market and could be purchased by newcomers, especially young families with children. Thus, areas with a high concentration of population over age 60 are the most likely places of upcoming population turnover.

The abovementioned project maps were created throughout the summer of 2004, and submitted to the Superintendents office for review in September 2004. In addition, the maps were made publicly available on a website. Following the initial submission of the data, the superintendent’s office of ISD# 709 chose not disclose or discuss the data with school board members until November 2004 (following the school board decisions to close several schools in the district). In January 2005, a special meeting of the school board was called, and the project results were presented in a public forum. The superintendent and school board agreed that further interpretation of the data now
available is necessary and should be integrated into further considerations for long-range enrollment planning (Duluth School Board 2005).

While the process of cooperation with the School District, especially the superintendent’s office, was excellent throughout most of the project, little communication followed the delivery of preliminary results of the study in September 2004. The study was not brought into the discussion about the potential closings of several elementary schools as another data source for public discussion. In December 2004, the principle investigator for this project was approached by Lisa Michaels, reporter for the Duluth New Tribune, and interviewed about the project. A subsequent article in the Duluth New Tribune on December 19, 2004, presented the results of the research and identified the fact that the preliminary study results had indeed been shelved instead of having been incorporated into public debate (See the full text article in Appendix C). According to superintendent Almanza, such omission was due to the complexity of the data and its potential for creating misunderstanding: “I don’t think, the way it sits right now, it’s going to be easily understood by a lot of people” (Michaels 2004, 6A). This seems especially surprising given the fact that Almanza himself repeatedly touted the importance of this data for the long-range efforts of the school district. In the same interview with Michaels he said the data is “useful information. I would like to use this data” (Michaels 2004, 6A). Almanza repeated such confident support of the data in the School Board meeting of December 21, 2004, only two days after the publication of the article in the Duluth News Tribune. While it is true that the project was not completed at the time the decision about school closings were made in October and November 2004, it still seems surprising that many school board members
were never informed about the progress made in the project and the over 40 maps supplied to Almanza in September of 2004. While several board member had access to the data, the majority of them had not heard from Almanza about the progress of the project. According to Time Akervik, school board member, the project was announced by Almanza, but further than knowing it as a work in progress, no updates were communicated to the full board:

“I would have liked to have known that it had been done. We knew that it was a work in progress. If they indeed put in two years on this project, I think it would have been nice to know what the results were – whether somebody thinks it was difficult to understand or not” (Michaels 2004, 6A).

In conclusion, it can be observed that while the data was delivered to the superintendents office at an admittedly busy and politically charged time, little communication between the school district, the school board and the UMD research team was initiated by the community organization profiting from this university-sponsored effort. Such disconnection, while understandable, is particularly undesirable for the organization funding such work. Larry Knopp, director of the Center for Community and Regional Research (CCRR) at UMD, commented that such politicized tactics are unfortunate:

“Obviously we like to see that our projects are put to some kind of practical use. It’s not common that the community-based agency and the university researchers disagree on the usefulness of what’s produced through one of these projects. Why the results were deemed insufficiently usable by the superintendent, I don’t know. If he’s saying that we can’t use statistics because they’re too complicated for school board members to understand, then I guess there’s an awful lot of research that would never get done” (Michaels 2004, 6A).
It is the hope of the project research team that the data published here, while certainly only being a small contribution in the large debate about school enrollments, can make a contribution to the future public debate on this issue and that transparency and open communication are further enhanced between community organizations, schools and university scholars.
Methods

Data Collection, Technical Aspects, and Statistical Methods

For this project, data from the United States Census 2000 was imported and analyzed in the Geographic Information System (GIS) ESRI ArcMap 9.0. Duluth Public School boundaries for elementary, middle, and high school were imported and geographically cross-referenced with Census block and Census tract data to determine population trends for each school. Population development was projected for the maximum years allowed by the Census data (based on statistical reliability): 2000-2005 for elementary schools, 2000-2011 for middle schools, and 2000-2014 for high schools.

Population projections attained through GIS analysis were compared to enrollment data provided by the Duluth School district for the years 2000-2003. The relationship between population (potential enrollment) and actual enrollments was not 1:1. Therefore, the population trends were regressed against the actual enrollment to improve the model the behavior of population development closer to the development of actual enrollment trends. SAS, a statistical program, was used to test for outliers in this regression. Studentized and R-student residuals were used to identify several schools that had a different relationship between population (potential enrollment) and actual enrollment. Separate regressions were applied to these schools.¹ These regressions were

¹ If more detail is needed, the following table indicates the schools identified by the studentized and r-student residuals as possible outliers:

<table>
<thead>
<tr>
<th></th>
<th>2000</th>
<th>2001</th>
<th>2002</th>
<th>2003</th>
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<tbody>
<tr>
<td>Chester</td>
<td>-</td>
<td>+</td>
<td></td>
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<tr>
<td>Lowell</td>
<td>+</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Central</td>
<td>-</td>
<td>+</td>
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<tr>
<td>Lowell</td>
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<td></td>
<td>Central</td>
<td>Lowell</td>
</tr>
<tr>
<td>Central</td>
<td></td>
<td></td>
<td>Lowell</td>
<td>Central</td>
</tr>
<tr>
<td>Ordean</td>
<td>East</td>
<td>East</td>
<td>East</td>
<td>East</td>
</tr>
</tbody>
</table>

Schools that are not bolded were borderline (not necessarily outliers), while schools that are bolded were outliers according to the statistical tests. - Schools had a lower enrollment than would be predicted by the regression and + schools had a higher enrollment than would be predicted by the regression.
applied to the population (potential enrollment) for each year so that the relationship between population (potential enrollment) and actual enrollment was 1:1. An r-square value of 0.92 indicated that 92% of the variation in actual enrollment could be accounted for by using Census projections.

GIS was used to create maps of the change in enrollment for each school. Additional maps were created to display the population change of Census blocks and Census tracts within the boundaries of each school. Maps were also created for the city of Duluth displaying the Census block and Census tract changes for the following age classes: 5-10 years (elementary school), 11-13 years (middle school), and 14-17 years (high school). The complete set of maps, data tables and charts can be found in the appendices of this report.

Therefore, based on this analysis, we used separate regressions to correct for the enrollment of Central (more -) and the enrollments for Lowell and East (more +).
Analysis

*Census Population by Age Groups: Present and Projected Populations*

At the outset of the project, ISD# 709 superintendent Almanza indicated that the district already has some data about Census population in the Duluth area, but at an insufficient level of demographic and geographical detail. He asked the project researchers to assist him in generating maps that show the census population of the city not just at the tract level, but even at the block level. In addition, this data was broken down by age groups representing children of elementary, middle and high school age. Thus, the first part of this analysis now focuses on the Census tract and block population in the area of ISD# 709, and separates this geographic division further into age groups corresponding to elementary, middle and high school children. Further, this first set of analysis included projections of Census populations for the years 2005 (for elementary schools), 2011 (for middle schools) and 2014 (for high schools). The maps produced can be found in Appendix A, and they are figures 1-12. They show Census population by age group, but also have the boundaries of school attendance areas superimposed on them.

For children of elementary school age (5-10 years) several trends are observable on the Census tract and block level (See Figure 1-4 in Appendix A. The strongest concentration of children lie in the attendance areas for Lester Park, Lowell, Stowe, and Homecroft. Each of the attendance areas has at least one census tract with more than 300 children. In the Homecroft and Lakewood attendance areas, these tract lie in the very southern sections, near the boundaries with Chester Park and Lester Park elementary schools. Comparing the 2000 data to the 2005 projections, the maps show that most Census tract and block areas have lost population, and thus enrollment potential. Notable
exceptions are several tracts and block in the attendance areas for Grant and Nettleton elementary schools, where tow Census tracts have experienced a population growth rate between 51 and 75% (See Figure 13 in Appendix A). This growth however is not reflected in the actual and enrollment figures for these two schools, as the data compiled by the school district shows (see Table 5 in appendix D).

For the middle schools in the district, a similar picture emerges (see Figures 5-8 and 14 in Appendix A). In this case, the maps show the Census 2000 data as well as census population projections for 2011. The largest concentrations of students between the age 11-13 can be found in the attendance areas for Woodland and Ordean middle school. Figure 14 reveals that population growth over the 11 years of the projection period will only occur in the very southwestern section of the Ordean attendance area, the south-central portion of Woodland attendance area and the northeastern section of Morgan Park attendance area.

Trends for the high school attendance areas are depicted in Figures 9-12 and 15. While almost all Census tracts and blocks with the district limits are going to lose population and thus potential enrollment between 2000 and 2014, several areas of strong growth can be identified in the southern boundary region between Central and East High School, and in the southwestern corner of Central High School attendance area. Here, the population growth rate over the projected period of 15 years will lie between 51-75%, similar to growth rates for Grant and Nettleton Elementary schools. In fact, it is exactly the same census tract for both the abovementioned elementary and high schools that will experience growth. This is not surprising as the predicted growth for elementary schools
between 2000 and 2005 will translate into growth for the high schools ten years later (given that children do not move out of their census tract within this period of time).

**Population by Attendance Area**

As a second step in this analysis, the school district requested detailed maps of Census population, broken up into attendance areas for elementary, middle and high schools. Such visualization of population data serves purposes. First, it allows researchers to identify the census tracts and blocks that experience growth and decline within an attendance area. Second, it allows the school district official to redraw existing attendance area boundaries based on changing population concentrations, in order to alleviate any enrollment imbalance that shift the burden of additional student population to certain schools. Figure 16-33 show the distribution of Census population of children age 5-10, 11-13 and 14-17 for each respective elementary, middle and high school attendance area for the years 2000, 2005, 2011 and 2014.

Figure 16 shows the Census block population distribution for Chester Park Elementary School in 2000 and 2005. It is evident that with the exception of one block located north of UMD, all other Census blocks are loosing population. This is reflected by the data represented in Tables 3 and 4 in Appendix B. According to our calculations, Census population with the entire attendance area declined from 519 to 429 potential students in 2005 — a net loss of almost 18 percent. These numbers are, however, not reflected in the actual enrollment for this particular school. As Table 5 in Appendix B indicates, in 2004 Chester Park had between 268 and 273 students in total — very little fluctuation compared to the entire five-year period. What is noticeable, however, is that
this school, according the population statistics, has an enrollment potential of 429 in 2005. In other words, almost 150 students that live in Chester Park’s attendance area, attend school elsewhere.

Congdon Park Elementary School (Figure 17) exhibits quite different relationships between potential and actual enrollment. Table 3 in Appendix B shows a decline of potential student enrollment from 441 to 361 students – a loss of 18 percent. In contrast to these losses in our projection, actual enrollment at Congdon Elementary in 2004 was between 460 and 462 students – numbers close to the Census population of elementary school age in 2000 in this attendance area. In other words, while this area has lost Census population, or potential enrollment, it must have compensated for this loss by accommodating students for other attendance areas.

Grant Elementary School (Figure 18) shows growth patterns in potential enrollment, but strong discrepancies between actual and potential enrollment. Tables 3 and 4 in Appendix B show that Grant’s Census population grew from 397 to 437 potential students - a growth of about 10 percent. In contrast to such remarkable growth, the number of enrolled students for this school hovers around 180 students in 2004 – a gap of more than 250 students that are accommodated by other schools.

Homecroft Elementary School (Figure 19) shows trends similar to Chester Park. From 200 to 2005, this attendance area lost more than 100 potential students. Its Census population declined from 506 to 405 students – an almost 20 percent loss. Again, this is a school that shows discrepancies between potential and actual enrollment. Actual enrollment in 2004 for this school is at about 320 students, meaning that during that year almost 100 students living in this attendance area attended schools elsewhere.
Lakewood Elementary School shows population development similar to that in the Congdon Park attendance area. All Census block areas in the attendance area are either lost population or remained stable between 2000 and 2005 (Figure 20). Overall, potential student population in this area declined from 220 in 2000 to 166 in 2005 – a net loss of 24.2 percent (Tables 3 and 4 in Appendix B). Actual enrollment in this attendance area in 2004 lay between 283 and 285 – significantly above the actually predicted Census population (Table 5 in Appendix B). As in the case of Congdon, this means that this school accommodates more students than actually reside in its assigned attendance areas, and thus to some degree compensates for the losses of other schools.

Laura McArthur Elementary School’s population and potential enrollment trends are visualized in Figure 21. While Census blocks in the western and central sections of this attendance area have experienced growth, most of the remaining territory experienced either stagnation or decline of population, resulting in an overall loss of 30 potential students from 2000 to 2005. While 543 students resided in the area in 2000, only 513 of them remained in 2013 – constituting a loss of 5.6 percent. Actual enrollment of this school in 2004 was at 455, about 60 students below the actual number of elementary school students residing in this area.

Lincoln Park School (Figure 22) offers education from kindergarten through grade 8. With the exception of a few Census blocks, this attendance area has seen very little change from 2000 to 2005, with losses scattered out evenly over the entire attendance area. Tables 3 and 4 in Appendix B indicate a loss of 31 potential students - a minus of 4.7 %. Actual enrollment in 2004 was just over 600 students, very close to the
predicted 604 students, based on the projection model. In other words, in this attendance area, there is a very good overlap of actual and potential students.

Lowell Music Magnet School (Figure 23) is the second largest elementary school in the district, second to Lincoln Park (which offers K-8 education). The analysis of this attendance area indicates that several census blocks of this area have seen significant student population losses between 2000 and 2005. Blocks in the northern, westernmost, and easternmost sections of the attendance area lost up to 10 students each. Overall, this analysis calculated and overall loss of 40 students between 2000 and 2005 – 6.6 percent of its total population (Table 3 and 4 in Appendix B). Actual enrollment in 2004 was around 520 students, 41 students below the projected 561 for the same year (Table 5 in Appendix B). Consequently, this attendance area is among those with a potential student population above the actual level of enrollment.

Nettleton Elementary School is experiencing the strongest growth of Census population when compared to all other schools. Most this growth is concentrated in the northern blocks of this attendance area (Figure 24). Table 3 and 4 in Appendix B show that projected growth for this attendance area was calculated as a 23 percent increase, from 380 students in 2000 to 467 students five years later. This strong increase in potential student population is not reflected in the actual enrollment. In 2004, this school accommodated between 311 and 317 students, creating a discrepancy of over 130 students, when comparing actual enrollment and residing student population. A significant number of students in this attendance area are thus attending school outside the boundaries of their assigned neighborhood school.
The attendance area for Piedmont Elementary School is experiencing the second-strongest loss in Census population, when compared to all other schools (See Figure 25 and Tables 3, 4 and 5 in Appendix B). The strongest losses are concentrated in the central blocks of the attendance area. The projection data shows a decline of more than 50 potential students between 2000 and 2005 (from 265 to 210 students), a loss of almost 21 percent of the entire population in age group comprising elementary school children. In comparison to these numbers of decline, the actual enrollment in 2004 stood at 237 students – significantly higher than the numbers of students actually resigning in the attendance area. Again this suggests that a certain number of students that are attending Piedmont are coming from outside of the attendance area.

Contrary trends hold true for Lester Park/Rockridge Elementary School attendance area (Figure 26 and Tables 3-5). Overall, this area is loosing about 6 percent of its elementary school student population, yet the area also seems to compensate this loss with accommodating students from other schools. Lester Park/Rockridge’s population dropped from 519 in 2000 to 487 in 2005, a loss of 6.3 percent. In addition to this decline, the area actually served 463 students in 2004, more than 20 students below the number of actual children residing in the attendance area.

Stowe Elementary School is facing a situation similar to the Piedmont attendance area (Figure 27). Overall, this area is facing a visible decline of student population, and experience a loss of almost 13 percent of its base between 2000 and 2005. Elementary school population residing in the attendance area dropped from 419 to 365. In contrast, actual enrollment for Stowe in 2004 was at 431 students – significantly more than actually reside in the area.
The Census population projections for middle school attendance areas in ISD# 709 were calculated for the years 2000 to 2011, for Morgan Park, Ordean and Woodland schools. Morgan Park Middle School is the smallest of these three (Figure 28). Attendance in 2004 was between 540 and 526 students during the last three months of the year (Table 5). The Census population projections depicted in Tables 3 and 4 outline a rise in potential students between 2000 and 2005, and then a decline up to 2011, with numbers dropping below the rates of a decade earlier. While the area experienced an 8.5 percent increase in population from 2000 to 2005, the overall population loss between 2000 and 2011 is 4.5 percent. Morgan Park’s Census population will decline from 453 in 200 to 432 students in 2011, with these numbers again being significantly below the actual enrollment figures discussed above. In contrast to such fluctuating trends and rather moderate decline of population, both Ordean and Woodland Middle Schools will see significant losses of student population (Figure 29 and 30). Both are larger middle schools with over 750 students each, and they will see a total loss of student population between 17 and 29.3 percent. In 2004, these schools had 775 and 831 students, respectively. Projections for 2011 lie significantly below this. In other words, there are currently more students enrolled in these attendance areas than actually reside there. In the next few years (until 2011) less and less students will fill these seats due to the rapid decline of middle school population. Right now, more students coming in from outside of the attendance area than actually live in it. Based on the projections, this will be not the case much longer. In fact, when looking at the numbers for 2011, there are going to be less students in the area than could fill the presently occupied openings in each school.
The situation for the three high schools is similar. Central, Denfeld, and East High School’s resident population of age 14-17 was projected for the years 2000 to 2014 (Figures 31-33). Each area will see a significant decline in student population, with the smallest losses for Denfeld and the highest recorded for East High School (Tables 3-5 in Appendix B). Over the course of 15 years, Denfeld will see a resident population decline of over 100 students from 1063 in 2000 to 961 in 2014. This constitutes a loss of 9.7 percent of its total student resident population. In 2004, Denfeld had between 1222 and 1170 students, over 100 more than actually resided in this attendance area at the time. Similar trends of declining student population can be observed for the other two high schools, albeit at much higher rates than for Duluth’s westernmost attendance area. Central High school will loose 13.3 percent of its resident population of high school aged children, and experience a decline from 1122 students in 2000 to 974 students in 2014. Actual enrollment for Central in 2004 was between 1027 and 1050 students, with the projection of Census population for the same year being at 1015 students. This represents a close match of actual enrollment and resident population for this attendance area. East High School will see the most dramatic decline of resident population. Its population base will decline from 1563 in 2000 to 1071 in 2014, a total loss of 31.5 percent. In 2004, East accommodated between 1392 and 1402 students, about 20 less than actually reside in the area. Again, this constitutes a close match of actual enrollment and residing population. Yet, given the expected decline until 2014, this attendance area will see much less of a population base to fill its open seats, and would have to compensate significantly by attracting students through open enrollment. In summation, all three high schools will see declining resident population, and thus face potential declines in enrollment.
Commentary on the Potential Political Implications of the Results

Whenever speaking of discrepancies between actual enrollment and potential student population, the authors of this report do not seek to suggest that this in any reflects upon the quality of education at any of the schools, or that certain schools do not have adequate facilities to accommodate enough students. The intention of the above analysis of Census data was simply to provide an impartially created data set that will allow school officials and parents to evaluate the existing "match/mismatch" or discrepancies of enrollment and student population, and to draw their own conclusion and provide their own analysis as to why this is the case. The authors are aware that these numbers are important for the future of enrollment planning, the reconfiguration of school district attendance area boundaries and the possible closure or consolidation of schools. In this regard, the report explicitly makes no recommendations or offers any solutions, in order not to contribute to or interfere with this very public and political process.

A "mismatch" of actual enrollment and potential population development as explained above does not mean that the schools discussed are not attracting enough students, or that they are overfilled. It is important to keep in mind the multiple factors that could influence the mismatches observed above.

- open enrollment allows parents to request a transfer of their child from the attendance area they reside in to a new school outside of this area. This report cannot account for the number of students that do not attend school in their area of residence. Our projections thus describe the maximum number of residents that
could account for the maximum number of potential students enrolled in each attendance area for 2005, 2011 and 2014. In actuality, these enrollment numbers might turn out to be higher or lower, due to the fact that enrollment allows for students to request a transfer to another school. This means that some schools might successfully be able to compensate for a lower resident population by attracting students from other areas, whereas some already struggling attendance areas with declining enrollment and shrinking population base might lose even more potential students than projected here.

Another factor to be considered that could not be accounted for in this analysis is the number of students coming to ISD# 709 schools from outside of the district or those who reside in the district but attend schools outside of it. This again has both beneficial as well as negative effects on potential future enrollment.

A third factor not considered in this report is the number of children attending private or charter schools in the district. Thus, school with actual enrollment below the number of children residing in the attendance area might have a large proportion of the population enrolled in these alternatives to the public school system. This report cannot account for the attendance areas where that most likely might be the case. Future analysis of enrollment should ideally include statistics from private and charter schools, to calculate which attendance areas and schools are losing the largest number of children to such competing institutions.
Evaluating population turnover by studying Population over age 60

In addition to the analysis of population development and the projection of enrollment potentials for school district ISD# 709, superintendent Almanza also requested data regarding the potential turnover of resident population. A good indicator of future areas of turnover is the population of seniors in a city. Seniors often move once they retire or, with an average life expectancy of 80 years, pass away about two decades after reaching retirement and thus vacate existing properties. For this study, the population over age 60 was analyzed, for both Census tracts and blocks. The results are displayed in Figures 37 and 38. The areas with the largest numbers of seniors shown will be those that will see the highest amount of turnover in the next two decades. As these maps indicate, the strongest concentration of seniors and thus the highest potential for turnover is located in Census blocks and tracts that overlap with the attendance areas for Central and Denfeld High School, Morgan Park and Woodland Middle School, and Chester Park, Lowell, Piedmont, Grant Lincoln Park and Laura MacArthur Elementary schools. In addition to such analysis, it would be useful to examine the plans of the City of Duluth for future housing developments, to see how these compare to this analysis of turnover in an already existing real estate market. The school district should cooperate closely with the city to develop a sense of where most of the new developments are going to happen that attract families with children. In this way, a comprehensive picture of the future housing market could be created to assist the school district in estimating enrollment figures and future financial demands of schools.
APPENDIX A

Project Maps
Maps of

Census Population by Age Groups, Tract or Block, and Projected Development
Ages 5-10 Census Tract Populations 2000

Legend
- Elementary boundaries
- # children 5-10 yrs
  - 0 - 75
  - 76 - 150
  - 151 - 225
  - 226 - 300
  - 301 - 375
  - 376 - 450

Figure 1
Ages 5-10 Census Block Populations 2000

Legend
Census Blocks
# children 5-10 yrs

0 - 5
6 - 10
11 - 15
16 - 20
21 - 25
26 - 30
31 - 35
36 - 40

Figure 3
Figure 4
Ages 11-13 Census Tract Populations 2000

Legend
- Middle School boundaries
- # children 11-13 yrs
  - 0 - 50
  - 51 - 100
  - 101 - 150
  - 151 - 200
  - 201 - 250

Figure 5
Ages 11-13 Census Block Populations 2000

Legend
Census Blocks
# children 11-13 yrs
- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30

Figure 7
Ages 11-13 Census Block Populations 2011

Legend
Census Blocks
# children 11-13 yrs
- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 25
- 26 - 30

Figure 8
Ages 14-17 Census Tract Populations 2000

Legend

- High School boundaries
- # teens 14-17 yrs
  - 0 - 50
  - 51 - 100
  - 101 - 150
  - 151 - 200
  - 201 - 250
  - 251 - 300
  - 301 - 350

Figure 9
Ages 14-17 Census Block Populations 2014

Legend
Census Blocks
# teens 14-17 yrs
0 - 10
11 - 20
21 - 30
31 - 40

Figure 12
Maps of

Census Tract Population Trends by Age Group
2000-2005 Census Tract Trends: Ages 5-10

Legend
- Elementary School Boundaries
- 2005 Census Tract Trends
- Percent Change from 2000
  - -41 - 25
  - -24 - 0
  - 1 - 25
  - 28 - 60
  - 61 - 75
- No Data

Figure 13
2000-2014 Census Tract Trends: Ages 14-17

Legend
- High School Boundaries
- 2014 Census Tract Trends
- Percent change from 2000
- -41 - -25
- -24 - 0
- 1 - 25
- 26 - 50
- 51 - 75
- No Data

Figure 15
Maps of

Elementary School Attendance Areas and their Census Block Population Trends
Figure 16

Chester Park Census Block Projected Trends 2000-2005

2005

2000

Figure 16
Figure 21
Figure 24

Nettleton Census Block Projected Trends 2000-2005
Figure 25
Figure 27
Maps of

Middle School Attendance Areas and their Census Block Population Trends
Morgan Park Middle School Census Block Projected Trends 2000-2011

Figure 28

2000

2011

# of 6-8 students

0
1 - 7
8 - 14
15 - 21
28

0
1 - 7
8 - 14
15 - 21
28

0
1.5
3
6 Miles

0
1.5
3
6 Miles
Woodland Middle School Census Block Projected Trends 2000-2011
Maps of

High School Attendance Areas and their Census Block Population Trends
Figure 33
Maps of

Population Trends by School Attendance Area (Maximum Enrollment Potential)
Figure 34
Middle School Enrollment Projected Percent Change 2000-2011

% change in enrollment
-29% Ordean
-17% Woodland
-4% Morgan Park

Figure 35
High School Enrollment Projected Percent Change 2000-2014

Figure 36
Maps of Potential Population Turnover (measured by population over age 60)
Age 60 and Older Census Blocks Trends

Legend

# people >60 yrs

- 0 - 25
- 26 - 50
- 61 - 75
- 76 - 150
- 161 - 500

Figure 37
Age 60 and Older Census Tract Trends

Figure 38
APPENDIX B

Data Tables and Charts
Table 1: Uncorrected Projections of School Attendance Area Populations 2000-2014

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### Table 4: Projections of School Attendance Area Population Change 2000-2014 (Potential of Enrolled Students)

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<td>East</td>
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<td>Merritt Creek Academy</td>
<td>97</td>
<td>97</td>
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<td>0</td>
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<td>Unity</td>
<td>58</td>
<td>55</td>
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<td>0</td>
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</tr>
<tr>
<td>Chester Creek Academy</td>
<td>66</td>
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<td>67</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>Woodland Hills</td>
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<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
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<td>Chisholm House*</td>
<td>27</td>
<td>28</td>
<td>29</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>AJC (Arrowhead Juv. Ctr.)</td>
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<td>29</td>
<td>16</td>
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<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Hospitals*</td>
<td>13</td>
<td>13</td>
<td>24</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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</tr>
<tr>
<td>North Star Middle School</td>
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<td>3</td>
<td>5</td>
<td>0</td>
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<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
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<td>Teen Parent</td>
<td>9</td>
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<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
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<tr>
<td>Total:</td>
<td>10,754</td>
<td>10,708</td>
<td>10,649</td>
<td>0</td>
<td>0</td>
<td>0</td>
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<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>
Chart 1: Total Duluth Schools Trends for Potential Enrollment

Chart 2: Duluth Elementary School Trends for Potential Enrollment
Chart 3: Duluth Elementary Schools with Increasing Potential Enrollment

Chart 4: Duluth Elementary Schools with Decreasing Potential Enrollment
Chart 5: Duluth Middle School Trends for Potential Enrollment

Middle School Potential Enrollment Trends

Chart 6: Duluth High School Trends for Potential Enrollment

High School Potential Enrollment
APPENDIX C

Media Coverage of the Project
Almanza dismissed school research

EDUCATION: New enrollment projections from UMD weren't reviewed before the School Board made decisions on closing schools.

BY LISA MICHALS
NEWS-TRIBUNE STAFF WRITER

Some of the most sophisticated enrollment projections sanctioned in recent years by the Duluth school district suggest eastern neighborhoods will lose the most students in coming years as the city's population shifts toward central and western Duluth.

Those research-based predictions could play a prominent role in any decisions to close middle schools and high schools, but they were left out of the recent discussions about closing elementary schools.

UMD's Center for Community and Regional Research was approached two years ago by Superintendent Julio Almanza to prepare the projection. Work was completed in September.

But findings have not been shared with School Board members, who made elementary school closure decisions in

See SCHOOLS, Page 6A

ALMANZA: Superintendent says research, which projects that eastern Duluth neighborhoods will lose the most students in coming years, was incomplete and not easily understood.
SCHOOLS | Almanza didn’t share projec

New enrollment predictions

The following enrollment predictions are the most detailed analysis of Census 2000 data and Duluth school enrollment data ever done.

### Duluth elementary school enrollment predictions

<table>
<thead>
<tr>
<th>School</th>
<th>2000 (actual)</th>
<th>2005 (predicted)</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chester Park</td>
<td>519</td>
<td>420</td>
<td>-17%</td>
</tr>
<tr>
<td>Coplen Park</td>
<td>441</td>
<td>351</td>
<td>-20%</td>
</tr>
<tr>
<td>Mendocino</td>
<td>506</td>
<td>405</td>
<td>-20%</td>
</tr>
<tr>
<td>Lakewood</td>
<td>220</td>
<td>160</td>
<td>-27%</td>
</tr>
<tr>
<td>Lakeville Park</td>
<td>943</td>
<td>753</td>
<td>-21%</td>
</tr>
<tr>
<td>Lakeview Park</td>
<td>519</td>
<td>405</td>
<td>-20%</td>
</tr>
<tr>
<td>Lorin Science/MtJ</td>
<td>300</td>
<td>100</td>
<td>-67%</td>
</tr>
<tr>
<td>Pleasant</td>
<td>205</td>
<td>210</td>
<td>+2%</td>
</tr>
<tr>
<td>Sleeve</td>
<td>419</td>
<td>365</td>
<td>-12%</td>
</tr>
<tr>
<td>Grant Magnet</td>
<td>397</td>
<td>357</td>
<td>-10%</td>
</tr>
<tr>
<td>Lincoln Park (K-8)</td>
<td>512</td>
<td>511</td>
<td>-0%</td>
</tr>
</tbody>
</table>

### Duluth middle school enrollment predictions

<table>
<thead>
<tr>
<th>School</th>
<th>2000 (actual)</th>
<th>2005 (predicted)</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morgan Park</td>
<td>431</td>
<td>432</td>
<td>+0%</td>
</tr>
<tr>
<td>Medinah</td>
<td>749</td>
<td>528</td>
<td>-29%</td>
</tr>
<tr>
<td>Woodland</td>
<td>906</td>
<td>856</td>
<td>-5%</td>
</tr>
</tbody>
</table>

### Duluth high school enrollment predictions

<table>
<thead>
<tr>
<th>School</th>
<th>2000 (actual)</th>
<th>2005 (predicted)</th>
<th>2011 (predicted)</th>
<th>2014 (predicted)</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Central</td>
<td>1122</td>
<td>1014</td>
<td>860</td>
<td>774</td>
<td>-13%</td>
</tr>
<tr>
<td>Denfeld</td>
<td>1063</td>
<td>1085</td>
<td>995</td>
<td>961</td>
<td>-10%</td>
</tr>
<tr>
<td>East</td>
<td>1153</td>
<td>1090</td>
<td>1185</td>
<td>1071</td>
<td>-10%</td>
</tr>
</tbody>
</table>

### Total enrollment

<table>
<thead>
<tr>
<th>School</th>
<th>2000 (actual)</th>
<th>2005 (predicted)</th>
<th>2011 (predicted)</th>
<th>2014 (predicted)</th>
<th>Percent change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Elementary</td>
<td>5450</td>
<td>5011</td>
<td>4511</td>
<td>3707</td>
<td>-15%</td>
</tr>
<tr>
<td>Total Middle School</td>
<td>2137</td>
<td>1973</td>
<td>1736</td>
<td>1736</td>
<td>-10%</td>
</tr>
<tr>
<td>Total High School</td>
<td>3748</td>
<td>3498</td>
<td>3498</td>
<td>3707</td>
<td>4%</td>
</tr>
</tbody>
</table>

SOURCES: Duluth Public Schools, Metropolitan Data Co-op, the Center for Community and Regional Research at UMD

NEWS TRIBUNE GRAPHICS

From Page 1A

October and November using less-detailed information.

"This data was available to the school district," said Olaf Kuhlke, the UMD researcher who led the project, and it was available before decisions were made to close Grant and Magnet schools. Kuhlke, an assistant professor of geography, said he worked on the data with students in a classroom setting.

Kuhlke said his interests are not political, and he's willing to impartially help board members understand the data.

"I am not going to help anybody say, 'This is exactly what this data says,'" he said. "I can certainly say what this data suggests. The data might suggest different things, and you can draw a number of different conclusions.'

For example, Kuhlke said, the data are intriguing in regard to the East and Central hillside neighborhoods. The research suggests that Grant and Magnet magnet schools are the only two that have the potential for enrollment growth.

Historically, though, Grant's enrollment has been far shorter of the number of students living within its attendance boundaries. That's because the district allows students to open enrol in other elementary schools, and many from the Grant neighborhood have done so.

Nonetheless, Grant parent Doug Bowen-Bailey said, he would have welcomed access to the new data before a school-closing decision was made.

"Obviously, those kinds of numbers are significant, so I'm not sure why they wouldn't have been shared," said Bowen-Bailey, who is among the leaders of an effort to enhance the school's programming to attract more students who are still open to the building.

"It definitely would have been helpful for the board to see that's where the population growth would have happened," Bowen-Bailey said.

UNITED RESEARCH

The research project was completed early in September — slightly later than Kuhlke and Almanza anticipated. Kuhinke said he delivered a CD-ROM and paper copies of the data to the superintendent's office but subsequently heard little from district representatives.

He has not publicized the research, deferring questions to Almanza.

"There were certain groups who might not have been interested," in circulating the research, Kuhlke said. "I wanted to stay out of the political discussions. My job is simply to provide data to those who are involved in the decision-making process."

In an interview Tuesday, Almanza said he felt the data's presentation was too complex to be readily understandable, and "I've never been able to run that CD-ROM."

Kuhlke, meanwhile, said he was never contacted about any
tions from study with the School Board

About the research

The research was conducted by the University of Minnesota Duluth, which analyzed data from the Duluth Public Schools. The study was funded by the Centers for Disease Control and Prevention and the School District.

Data collected included demographic information, academic performance, and school environment data.

The study found that students in schools with higher levels of poverty had lower academic performance. The study also found that schools with higher levels of poverty had higher rates of student discipline issues.

Other key projections from the study:

- East High School’s enrollment will decrease by 25 percent by 2040, while Congdon will decline by 20 percent and Bemidji by 10 percent.
- Keeping with the above projections, Duluth Public Schools enrollment will lose 25 percent of its students by 2040, while Woodland’s enrollment will drop 17 percent and Morgan Park’s enrollment.
- Bloomington Elementary School’s enrollment will decline by 25 percent between 2000 and 2040, the highest among the districts.

But Almanza said he did not consider the project complete. Therefore, he didn’t present it for the discussions about closing elementary schools.

He thought it was useful information, “It’s a good data point,” he said. “But I don’t think the way it sits right now, it’s going to be easily understood by a lot of people.”

That reaction to the research was unexpected.

“Obviously we like to see that our projects are put to some kind of practical use,” said Larry Knopp, director of the UMD Center for Community and Regional Research, which spent $3,500 on the project. The School District added $800. “It’s not common that the community based agency and the university researchers disagree on the usefulness of what’s produced through one of these projects.”

Knopp called the district’s reaction “unfortunate” and said Ruhike “has comport himself responsibly and professionally and with great generosity.”

“Has produced a solid product,” Knopp said. “I am fully supportive of what he did. I can fault him for nothing.”

Why the results were deemed insufficiently usable by the superintendent, I don’t know,” Knopp continued. “He’s saying that we can’t use statistics because they’re too complicated for School Board members to understand, then I guess there’s an awful lot of research that would never get done.”

School Board members said they would like to have made that decision themselves.

“I’d like to be able to draw my own conclusions or whether I can understand it or not,” Tim Grover said.

“If he didn’t think we would understand it, he could have brought the people in who did it to make a presentation to us,” Mary Cameron said.

Mike Akervik recalled that the superintendent had touted this research project a year and a half ago as an important tool for long-range planning.

“I would have liked to have known that it had been done,” Akervik said. “We knew that it was a work in progress. If they indeed put in two years on this project, I think it would have been nice to know what the results were — whether somebody thinks it was difficult to understand or not.”

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Study mapped population, not school enrollments

Regarding the Dec. 21 letter, "Duluth school enrollment projection unfathomable," which was a response to the Dec. 19 article on the School Enrollment Projection Project sponsored by UMD's Center for Community and Regional Research.

The Dec. 19 article was neither bad journalism, nor was it bad research involved. The letter-writer simply misunderstood some of the fundamental aspects of the project.

As reporter Lisa Michaels correctly stated, the research mapped the future development of population of age 5-17 in Duluth - not actually enrolled students. Based on this future development of population in each census block, it is possible to predict how many children of a certain age are going to live in a school attendance area.

In short, the research provides the number of children that potentially can attend a school in the attendance area they live in. The research does not predict how many children are actually going to attend the school in their attendance area. And the research does NOT predict any future actual enrollment in Duluth schools, but simply maps out how many children potentially could attend each school, based on the most recent census data.

The letter writer misrepresented many of the findings of the research to which he had no complete access and mixed up actual enrollment figures with predicted population development. Our study predicts declining population for all attendance areas but for Grand and Nettleton.

Superintendent Julia Almazan was right in his assumptions when stating that this data could certainly be easily misunderstood. This, however, does not explain why this data was not used in the past process of decision making and why I was never given the opportunity to explain the process of data collection and analysis to a larger public audience.

I could have provided insight and clarification, and prevented any misreading of the information I was asked to provide to the school district.

Dr. Olaf Kahlke
UMD
The writer is assistant professor of geography at UMD.
Bibliography


